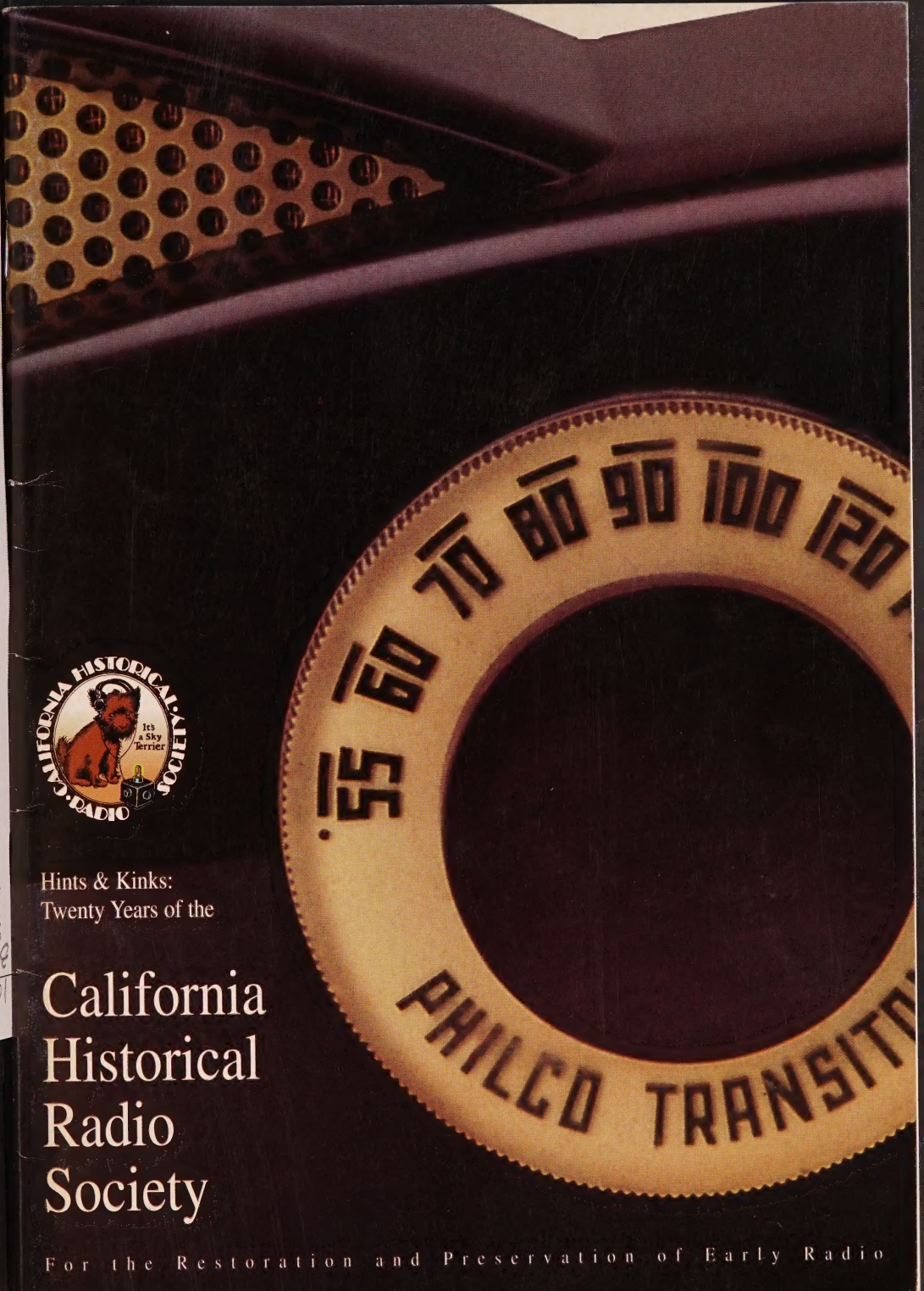

Hints & Kinks:
Twenty Years of the

California Historical Radio Society

For the Restoration and Preservation of Early Radio

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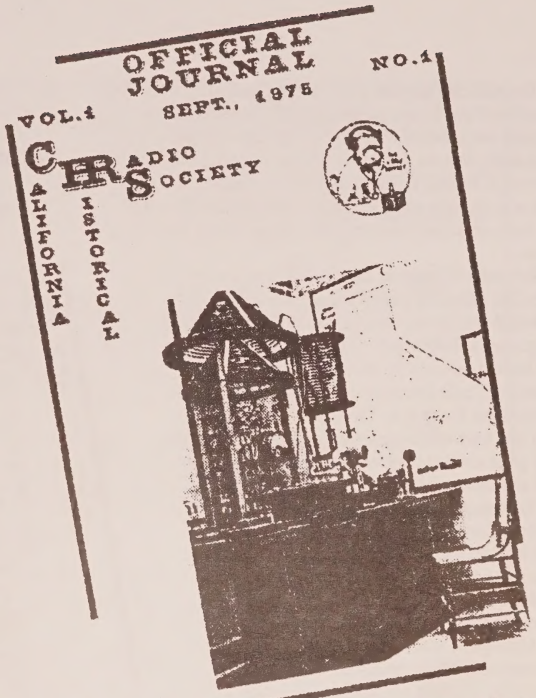
WHAT'S IN THIS ISSUE

This is a reprint of the Twentieth Year Anniversary Archive issue of the Journal of the California Historical Radio Society. We have taken out much of the Archive material (e.g., bylaws) and added more technical material up front, and an historical note from one of the Founders, Eugene Rippen, Esq. The focus of all of the technical material is the preservation and restoration of old radios, which is our corporate purpose.

To reach CHRS: call the Hotline at (415) 821-9800, mail us at CHRS, PO Box 31659, San Francisco, CA 94131 or go to our Internet site for Journal articles, CHRS information, swapmeet details, and selections from the Golden Age of Radio at http://www.antiqueradios.com/chrs/



ABOUT CHRS

The California Historical Radio Society (CHRS) is a non-profit coporation chartered in the State of California. CHRS was formed in 1974 to promote the restoration and preservation of early radio and broadcasting. Our goal is to provide the opportunity to exchange ideas and information on the history of radio, particularly in the West, with emphasis in collecting, literature, programs, and the restoration and display of early equipment.

The *Journal* of the Society is published and furnished free of charge to members. Yearly membership dues are $20 (U.S. funds).

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CHRS on the Internet:
http://www.antiqueradios.com/chrs/

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Placer County Radio Club

HOW IT HAPPENED—CHRS, THAT IS

Eugene Rippen, ESQ., Auburn, CA, a founding member of the California Historical Radio Society

885-6147

In 1974, having talked it almost to death for years, Jim Cirner and Norm Berge were sitting in Jim's living room one evening once again discussing the prospect of an antique radio club for the West Coast. They believed they already knew enough collectors in Northern California, alone, to make a success of it. They decided to quit talking it and just go ahead and do it.

The first thing that Norm and Jim did was to get a nucleus of collectors who would help them start it up. A few phone calls later, the original seven charter members were lined up to go to work.

Norm Berge was the first president. At the time he was working in the engineering department of Stanford Medical Center. Although he had only been collecting for four years, he had great enthusiasm and had already amassed over 150 radios in his collection. Norm had been repairing sets since the 1940's.

Jim Cirner, treasurer, was working for N.A.S.A. at the Ames Research Center in Mt. View. Jim already had over 250 radios, along with quite a collection of other radio items. He started repairing in 1948 and collecting in 1950.

The other five that Jim and Norm had hustled up were: Vice President Dave Brodie, a ham operator since 1955 and already a repairer and collector of old radios; but most important to the club at the time, he was a CPA. Second vice president Peter Brickey, a Hewlett-Packard employee, got interested in old radios in the early '60s and began collecting them in 1971. He had a broad interest from early wireless to '40s consoles.

Robert Middleton was one of the first seven. He had been into radios for a long time as the author of many technical articles that were published in many different magazines and other publications.

Our first editor of the Journal of the California Historical Radio Society was Ken Miller who was then working for Varian as an Electronic Engineer. He, too, had only been collecting for a couple of years but had that great newcomer enthusiasm. He had been a ham and already had about 30 sets in his collection.

To those six other original members you can add myself. Conveniently I was an attorney and did all that legal stuff to get it all official. At that time, I was also a newcomer to collecting, although I had amateur and commercial licenses and started repairing radios in 1937.

Although he was not actually one of the seven charter members, Larry LaDuc, Jr. was the club's first historian and had been collecting about two years at that time, collecting a mixture of everything: battery, crystal and AC sets.

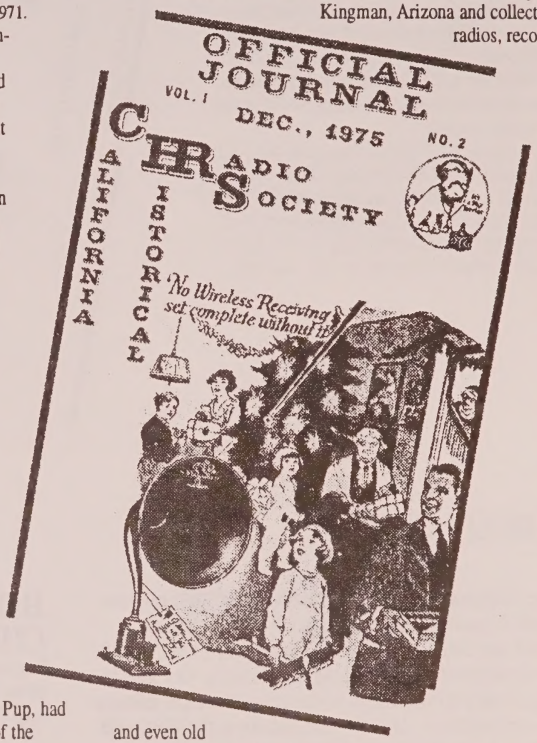
As it turned out, Jim and Norm were more than right. By the time that the first issue of CHRS's Journal was printed in September of 1975, only four months after CHRS was formed, the club had 25 members, and seven of them were from the Los Angeles area. Interestingly, the logo of the club, namely the Crosley Pup, had already been selected and began being on the covers of the Journal with the very first issue.

Being in the San Jose area seemed even more appropriate since it was the site of KQW, the world's first commercial broadcasting station. In fact, within a year, Jim and Norm had located the old KQW transmitter in San Francisco where it had been moved when KQW became KCBS and they got the station to donate it to the club, which in turn got donated to the Foothill Electronic Museum.

Under the regime of the initial officers, the swap meets were begun, some of which were in collaboration with AWA, complete with programs and guest speakers. In fact, at the second meet, Ray Newby was the speaker. In 1909, when Newby was just 16 years old, he provided Doc Herrold with the spark gap for first KQW transmitter. He also taught radio at Doc Herrold's technical school. Norm Berge tells me that he still has the tape recording of Newby's talk at that meet.

The original officers remained the same until September of 1978, with the exception of Allan Bryant, taking over as editor in the summer of 1977.

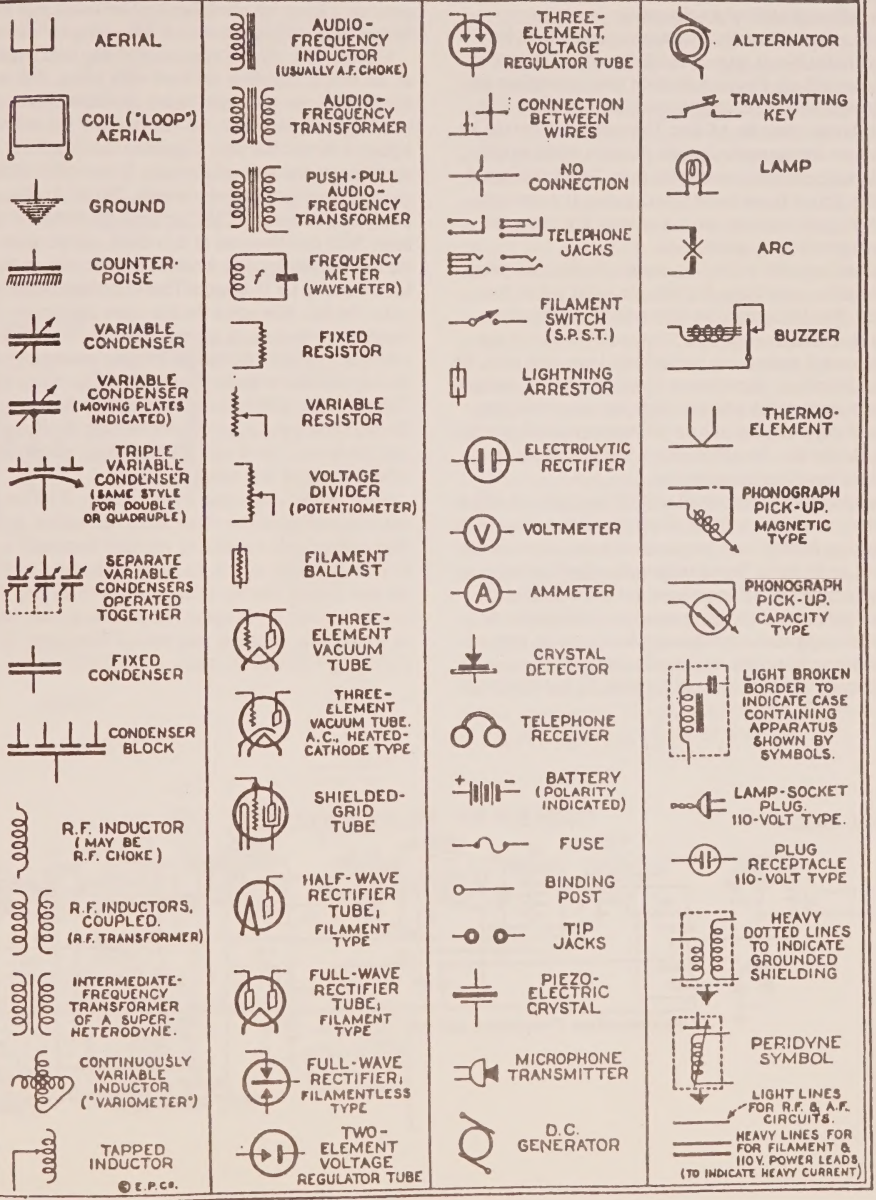
Robert Middleton and Dave Brodie are deceased but the rest of us are still around. Jim is retired from NASA living in San Jose, still repairing and collecting and is now in the antique business in San Jose. Norm is retired and living in Kingman, Arizona and collecting radios, records and even old big band posters, Kenneth Miller is still active and living in Fremont. Peter Brickey still collects and is living somewhere in the Santa Cruz Mountains. Larry LaDuc is in Campbell, California and is still collecting.



I have become a member again after having dropped out while in the Title Insurance business. I'm now in Auburn, California practicing law and I've got a couple of antique stores; about as retired as I'll probably get and looking forward to CHRS' next 20 years. —73—

STANDARD RADIO SYMBOLS

ADOPTED BY "RADIO NEWS", FEBRUARY, 1928



RESTORATING THE ALL AMERICAN FIVE

Jim McDowell

The All American Five tube radio is the most common radio design. This design became popular in the early 30s and lasted until tubes phased out. This circuit is the most widely used circuit in radio history, used in Catalins, Bakelites, and Wooden sets, as well as all kinds of novelty radios.

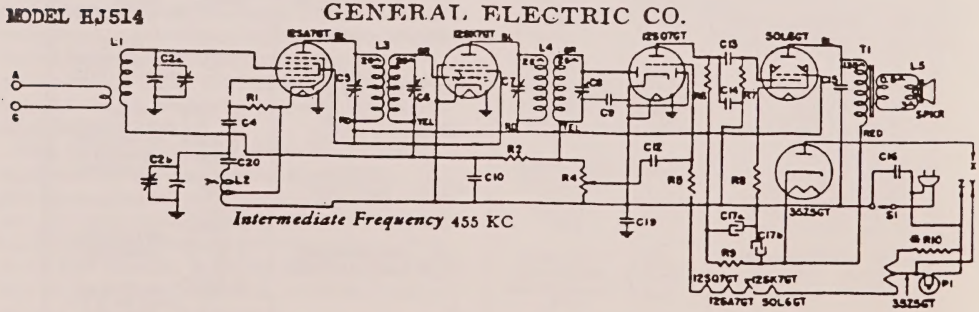
The diagram we will use for reference purposes is a GE No. HJS14 in Riders No. 11, page 11-52 GE. To service this type of radio is not difficult. First, test all of the tubes and replace any weak or dead ones. Next, replace certain key capacitors. The first one is C16 across the A/C line. This capacitor filters out RF signals from coming up the line into the radio, which would result in static and noise entering the radio. The second capacitor is C15, This is known as the tone capacitor. If it opens the radio will sound very tinny and it may howl. If it shorts, the 3525 will glow brightly and burn out.

The third capacitor is C13. This couples the first audio stage with the audio output stage. If it fails, the sound will be very distorted. Now let's replace the filter capacitors, otherwise known as electrolytic capacitors, C17a and C17b. This is one unit but we will replace it by two individual new style units. We will use 100 mFd at 160 volts units because they will eliminate all hum and are readily available. Some sets use a third electrolytic. Replace this one with the aboverecommended new style filter capacitor also. Be sure to observe the positive-negative polarity of the electrolytic capacitors.

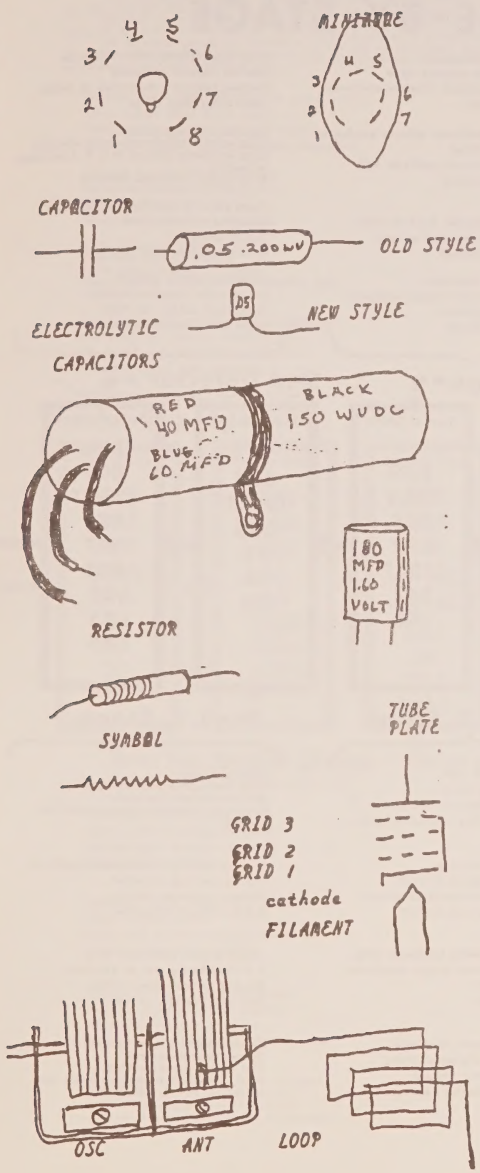
Now spray the volume control with TV tuner spray as well as any other controls. We will next turn to the antenna. Most of the all American five sets use a loop antenna (a coil of wire usually mounted on the back). If your set uses this, check the wires connecting it to the radio. If one is loose and you do not know where it goes, look at the tuning capacitor, which used to be called the tuning condenser. One wire belongs on the terminal of the large section of the capacitor. The other wire connects to the automatic volume control (AVC) circuit. To find this circuit look for resistor R2 coming off the volume control and capacitor C10. Connect the other loop wire here. The capacitors C15, C16, C13, will be marked with their values on them, such as: .01 at 200 volts. You can replace these with a higher voltage unit but never use a lower voltage replacement because it may short out. Always replace C16 across the A/C line with a 600 volt unit.

In some cases, the AVC capacitor C10 may need replacing. If so, the set will motorboat and howl while tuning. Post-war Zenith radios and some other makes use ceramic disk capacitors. If your set uses these, the only capacitor you will need to replace is the A/C line filter. Capacitors like C4 and C20 are in the RF stages and are usualy ceramic. If you try to replace them, you may never get your radio to work. The All American Five is a very reliable circuit but here are some tips to make it perform better. With the chassis out of the cabinet, and the knobs on and the loop antenna standing at normal position, turn on the set. Let it warm up for 15 minutes. Tune to a station on the lower end of the dial. Now adjust the four screw adjustments on the IF transformers for the most volume. Now tune to a station around 1400 kHz, and adjust the antenna trimmer, sometimes found on the loop antenna, or on the large section of the tuning capacitor. This adjustment affects the high end of the tuning range greatly. Be sure to use a plastic screwdriver, because these adjustments may shock you if the IF cans are "hot." Also, use plastic because a metal scredriver will detune the circuit.

Some of these radios have a metal cabinet. If so, use a three wire cord and ground the center wire to the cabinet, or mail the radio anonymously to a relative you hate! To connect an antenna to a hot-chassis set such as this, wrap an insulated wire arond the wire coming from the tuning capacitor to the loop. Connect it to the antenna. If you connect the antenna directly you may be sending line voltage up your antenna. Remember: Safety First! is the CHRS AC-DC motto. — Good luck.



TECH TIPS



RIVETS

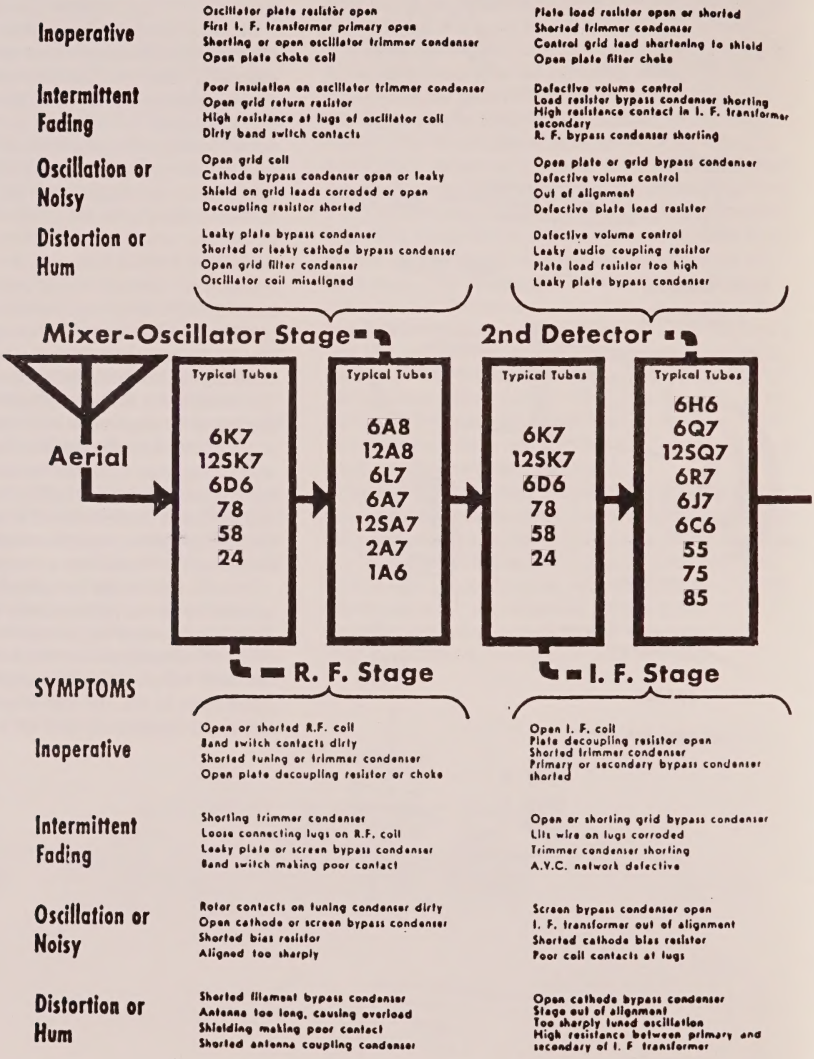
Rivets were often used in the production of radios. Often we have to remove them to replace a component. If we lack rivets and the associated tools, or the space is difficult to get to, or the material to be riveted is fragile, then a serious problem exists.

One solution is to make faux, ersatz or false rivets. They look like rivets from the outside but are used like machine screws underneath. Number 6-32 stainless steel, round head machine screws will work for most applications in radio work, but any size of roundhead machine screw may be used. Stainless steel can be polished to look like nickel or chrome.

Obtain some round-head screws of the desired size and length. Chuck them in an eiectric drill which has been clamped in a vise or clamp so the chuck is horizontal, or a lathe. Turn on the drill and, with a fairly coarse file, proceed to file off the head in such a way as to remove the slot. Keep the file moving over the screw head and vary the angle. Results will be more even if you reverse the rotational direction of the drill or lathe occasionally. When the slot is nearly gone, finish by removing it with a fine cutting file. When it is completely gone, polish the remaining head first with fine emery cloth; then crocus cloth. You should have a head approximately the thickness, shape and diameter of the original rivet with a nice satin finish. If you desire a mirror finish like nickel or chrome, just buff them on a cloth buffing wheel using stainless steel compound. Rotate the head with the fingers while buffing. The result will be quite nice and almost impossible to tell from a real rivet head. While the above procedure seems time consuming, You can make a rivet in less than a minute once you get the hang of it.

Place the rivet through the holes of the materials to be "riveted," attach a nut and tighten down in the normal way. You can control the amount of torque to just the amount you want without fear of damaging the material. A little thumb pressure on the "head" will generally give enough friction to permit you to tighten down the nut. The other advantages is that you will be able to take it apart much easier the next time! —PJB

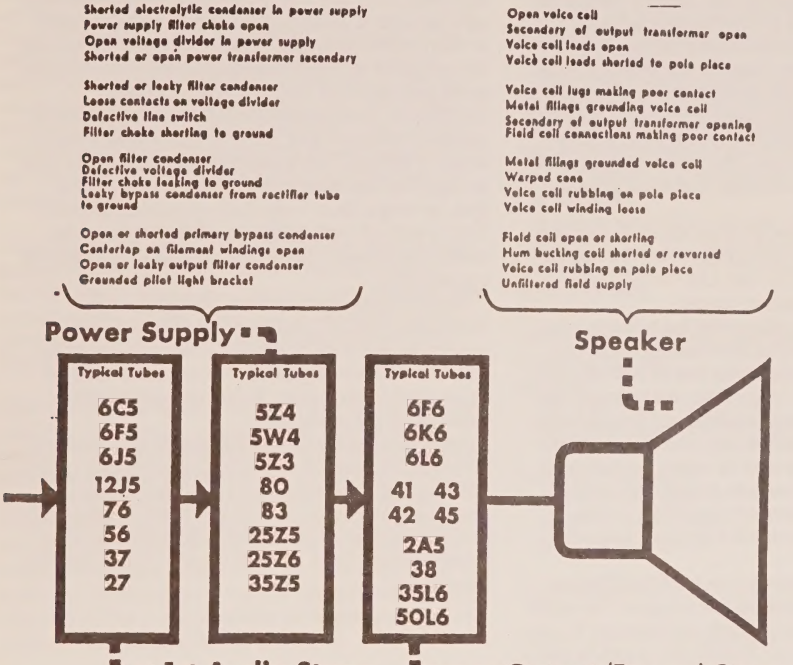
COMMON RADIO TROUBLES STAGE-BY-STAGE



With the growing scarcity of radio servicemen, you may find it necessary to trace down and cure the troubles in your own set. This handy "trouble-shooting" chart will help you do so.

The first move in tracing trouble is to have all tubes tested. *After* they have been eliminated as the possible cause of the trouble is the time to give thought to the parts in the receiver.

The common symptoms are listed at the left of the chart, and the probable difficulties for each individual stage listed to the right—each stage in the receiver being represented by a block in which is listed the tube types commonly associated with that stage.



BALLAST TUBES AND RESISTANCE LINE CORDS

From about 1933 to 1943 many table radios and some floor models were designed to operate directly from line voltage. These were called AC-DC or "transformerless" sets. The voltage for heating the tube filaments was supplied directly from the line. Since line voltage is 117 AC and the tube filaments required only about 6 or 12v (25, 35, or 50v for many rectifier and output tubes) a resistor had to be provided to drop the line voltage to the proper value to operate the filaments. The problem was simplified somewhat by connecting the filaments in series so that each filament acted as a resistor, dropping the voltage somewhat for the remaining filaments. In most cases, however, the line voltage was greater than the sum of the voltages required to heat the tube filaments and so an additional resistor was required to drop the remaining voltage.

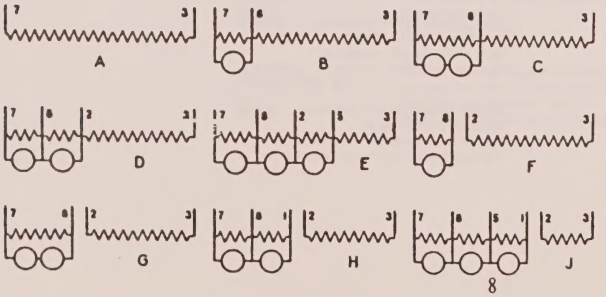
Example: A typical five-tube set of the mid-1930's used three 6.3v tubes and two 25v tubes connected in series. The total voltage drop was (3 x 6.3) + (2 x 25) = 69v. Line voltage is 117v, Therefore, (117 – 69) = 48v must be dropped.

The resistor dropping the voltage often had to dissipate considerable power and so would become extremely hot. In many cases the resistor was built into the line cord the form of a resistance wire running the entire length of the cord (resistance line cords). Since the heat generated was distributed along the entire length of the cord, the cord became only moderately warm and so posed little anger. In other cases the resistor was built into a tube called a ballast tube. These were glass or metal tubes that looked like ordinary radio tubes and plugged into a socket on the chassis. They were often identified by a code, such as the following:

RMA BALLAST CODE Example: type B-K-55-B-G The first letter (B) indicates a ballast tube but may not appear. The second letter (K) indicates the type of pilot light used in the set: K — a 6-8v 0.15A bulb is used. L — a 6-8v 0.25A bulb is used. In practice, any type of bulb can be used without harm to the set.

The number (55) designates the voltage drop in the resistor, including that for the pilot light. The letter following the voltage drop (B) indicates the circuit and base wiring (see below). The last letter (G) indicates a glass tube and may be disregarded. An "X" after the lamp-designating letter indicates a four-prong base e.g. LX55H.

In the wiring diagram below the numbers stand for the prong connections of an octal socket.



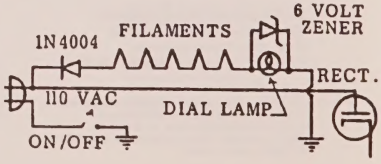
BY-PASSING DEFECTIVE AUDIO & IF TRANSFORMERS

Norman R. Leal, Livermore, CA

A radio with defective Audio Interstage or Intermediate Frequency Transformer can often be repaired without replacing or rewinding the transformer. For many of us, it is difficult to find a replacement that fits and we may not be set up to rewind transformer. In the case of IF Transformers, the early radios did not standardize on a frequency and an exact replacement may be nearly impossible to find. The transformer coupling can usually be replaced by capacitor/resistor coupling often without any loss of performance. In the case of Audio Interstage Transformers, connect a capacitor from the plate of the driving tube to the driven tube grid, The value is not critical. I suggest 0.1 mfd at 400 volts. Then bypass the open winding with a resistor. Again the value is not critical. If the plate to B+ side is open, try using a 22K at 1 watt. If the grid winding is open, a 100K 1/2 watt will work. I think you will be surprised at the results. The frequency response will probably be better than the original circuit.

You may do the same with Intermediate Frequency Transformers. With IF Transformers use small capacitors between the plate of the driving tube to the grid of the driven tube. This will allow the peaking of the one side of the transformer which is still working. In this case, capacitor values around 200 pf will usually work.

Again, the resistor value used to bypass the open winding is not critical. The same values used for Audio Frequency circuits will work. I have suggested rather low resistance values so almost any circuit will work. In the case of tetrode tubes like the 24A, it is important to keep the plate voltage above the screen and tubes like the Triode 27 should also be used with fairly low plate resistors.



REPAIRING RADIOLA IIIA AUDIO TRANSFORMERS

Ted Stewart, W6NPB, Oakland, CA.

STEP ONE: Terminals on the transformers are numbered, referring to the wiring schematic. measure the resistances of the primary and secondary windings. Record these winding resistances together with a diagram of the terminals and their numbers. Note: The example measurements here are ones taken during the writing of this article. The first audio primary winding measured 647 ohms D. C. R, the secondary over 1 Megohm. The primary is from #1 to #2, the secondary from #3 to #4. After repair, the secondary winding measured 8388 ohms D. C. R. The interstage, transformer has a primary that measured 810 ohms D. C. R. The secondary is centertapped and is numbered 1-3-5 with #3 being the center tap. My transformer measured infinity from terminal #1 to #3, terminal #3 to #5 measured 5270 The conclusions are that both transformers have problems and step #2 will begin the attempted repairs.

STEP TWO: After unsoldering the terminals, removing the transformers, removing the covers of the coil, carefully remove beeswax, using caution not to damage leads into coil. Attach tabs to leads to identify numbers, since you will be making measurements and its easy to mistake unmarked leads. Unsolder leads from terminal block.

STEP THREE: You should now have a stainless steel or equivalent small Pot to heat paraffin or candle wax to warm up the coil assembly. Use a hot plate or soldering iron for the heat source. In a few minutes you should find the coils will separate, and if you use caution, the leads will easily come, too. In the case of the centertapped interstage, the primary telescoped into half of the secondary winding and the other half of the secondary telescoped into the primary. Observation: the construction of the transformer was apparently in stages of separately wound coils, since each coil had enough insulation and wrapping to allow separation without damaging the lead attachment.

STEP FOUR: Identify the defective coil. Remove all excess material not involved in the repair a square foot at least. Lay the coil on a clean white cloth or paper, position your ohmmeter nearby and use a small alligator clip on one lead with a probe of copper wire on the other. It may be necessary to use something stronger, a paper clip perhaps. At least you will find it necessary to gently probe into the enamel covered wire (.0025 dia.)

STEP FIVE: At this point, the work will pay off or not. Connect one alligator clip to one lead of the defective coil. With the other lead equipped with a probe, locate the continuity of this lead to the coil winding you see at some point on the winding, by a removal of the enamel, but not damaging the wire After you verify that the lead you have attached does have a good connection to the coil winding visible, take the probe to the other coil position and probe in the area of the attachment of the other lead and as in the case of my repair, was just underneath the insulation but did require removal of about 1/4 inch of winding to pick up continuity. I found it necessary to use a magnifying eye loupe in all of the coil probing and resoldering operations.

STEP SIX: The same process is used for the other transformers. Be careful not to break off new terminations by tight insertions of the other coil. I ran ten (10) milliamps through all repaired windings after repair to insure good solder connections were made. Each .0025 inch wire was cleaned of enamel by #00 sandpaper. Burning enamel off will work with care. Removal by chemical removers is OK too if cleaned after use. The safe method I use is to simply flood the wire with rosin core solder until visible tinning has taken place.

Finally, the overall satisfaction of the repairs was good because the transformers were well made and not difficult to repair with care. This method does take perhaps more time and care than replacing with a standard interstage coil available, but there is a pleasure to be had knowing it is an original with the thorn taken out!

It may be worthwhile to bake the completed repair in some type of compound, but if repairs are ever to be done again, maybe not. At least paraffin would not be a problem to remove in case of re-entry.

STEP SEVEN: Take and note final measurements on the transformers; in this case:

Interstage:

Pri 1-2 647 ohms DCR 9 Hy Q=2.0
Sec 3-4 8388 ohms DCR 400 Hy Q=1.7

Interstage Centertapped:

Pri 2-4 810 ohms DCR
Sec 1-3 7870 ohms DCR
Sec 5-3 5420 ohms DCR

Final measurements made with ESI 250 DA DC bridge.

[*Editors' note: this kind of careful procedure should work with other sorts of audio transformers, one of the trickier aspects of restoration of vintage radios.*]

RESTORATION TIPS FOR THE MAJESTIC MODEL 71-B RECEIVER

Chris J. Buttery

I recently acquired a Majestic 71-B receiver, where I was quite fortunate that the cabinet's condition is excellent. However, as one might have guessed, the receiver did not play when plugged in. The dealer was upfront and told me about it before I decided to buy it, so there was no harm done and I was proud of my new set. Now I'm even more proud, since I successfully was able to get the set going—being the first project I tackled totally on my own. Regarding the history of the set, this was not the model that Majestic scooped the radio industry with in 1928, (where their total output peaked 4000 sets a day!), but this was their mid-season model introduced in January 1929. Both the 71 and the 71-B have basically the same chassis, power supply and speaker with minor modifications. The 71 was housed in a typical highboy cabinet of the period. The set I obtained is contained in a very attractive Lowboy cabinet. The most noticeable change on the chassis is the position of the control shafts, which are spaced closer together to accommodate the newer cabinet. Also a resistor was added to the power supply.

The main problem with the Majestic products of this period, models 60, 61, 71, 71-B, 72 and 181 radio-phonograph combination, is that they all had separate power supply units which were tied to the radio chassis with a wire harness, in which the plastic wires have deteriorated over the period of some 60 years. The plastic insulation on these wires has cracked to the point where they can cause serious shorting problems with the set. It is in the best interest for the set's preservation (if it is to be played) to completely replace the wiring harness with one you can easily make on your own.

As soon as I got the set home, I removed both chassis and the speaker. I began cleaning them, and began to form the new wire harness. Approximately 60 to 75 feet of 18 or 20 gauge stranded wire is sufficient for this project. Plan to spend a good part of a long evening to work at a comfortable pace. It is also advisable that this time should be void of distractions, to prevent miswiring.

Begin by disconnecting each lead individually, starting at the terminal board with the underside of the radio chassis. Replace the old lead wire with a 3 to 4 foot strand of wire. I've found that it's best to solder the lead there first, then run it to the terminal card where the other end is soldered. The weight of the chassis will help you in later braiding the wire, since it can be pulled and kept taut After the first lead has been soldered in place, simply twist each additional lead around the previous one laid, in order to form the new harness. There are a total of 12 leads for the set. For those who get confused with the connections, or are missing the original wire harness, or if it has become disconnected from the terminal card, use the wiring guide in figures 1A and 1B to help you with the connections. Once the wiring harness is completed, put aside the chassis and take a breather. The next step is to completely wire the power supply and you may want to attempt that project on a different day.

Remove the power supply's cover and you will notice that it is made up of four sections within the housing: the filament transformer; the B+ transformer; the filter choke; and the filter capacitor pack. All units can be removed individually, if necessary. Replace each lead with a new wire, and remove them individually to avoid confusion with the wiring (see figure 2 for layout of the terminals on the power supply). It will be necessary to remove the terminal strip on the top of the power supply to remove have access to the wiring underneath.

Examine the filter pack for leaking tar, since this may be an indication of shorting filters that overheat when the set is on. Even if the filter pack looks all right, it may be a good idea to replace the capacitors, to prevent possible damage to your power supply in the even one shorts.

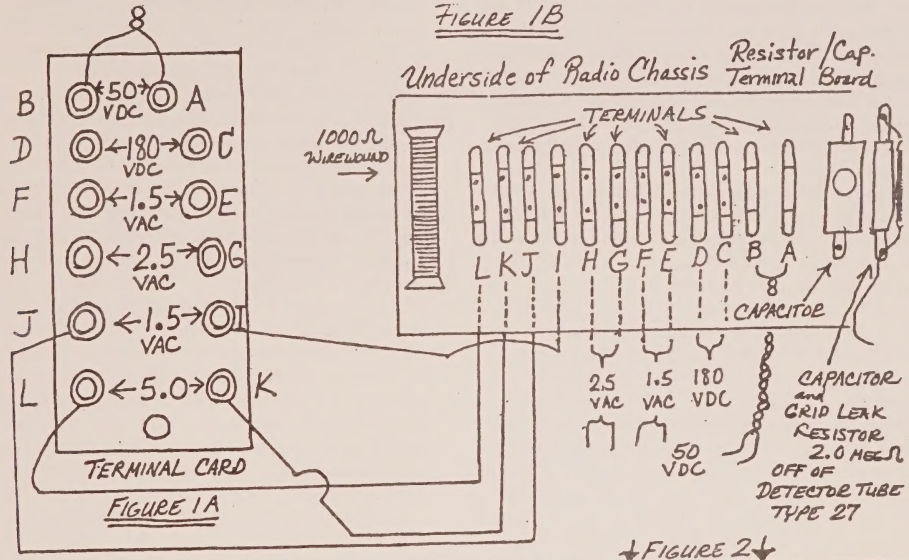
There are no floating grounds in the circuit and the caps are easy to replace in a set of this vintage. Loosen the bolts on the right side of the power supply housing. Then remove the leads, making note of their positions. The top terminal is the common ground for all four filters in the pack and can be connected as shown in figure 2. Remove the filter pack, if should just slide out. Bend the metal edge of the pack outward, so that the cardboard with the terminals on it can be removed. There should be enough space to insert new filer caps without melting the tar, once the original leads are removed. Once the filters are in place (I used four 10μfd at 450 volts) and terminals are securely soldered, the pack can be closed up and reinserted into the housing. Reconnect it back into the circuit. Once this has been completed, I'd suggest a careful examination of the speaker leads. If in poor condition, also replace.

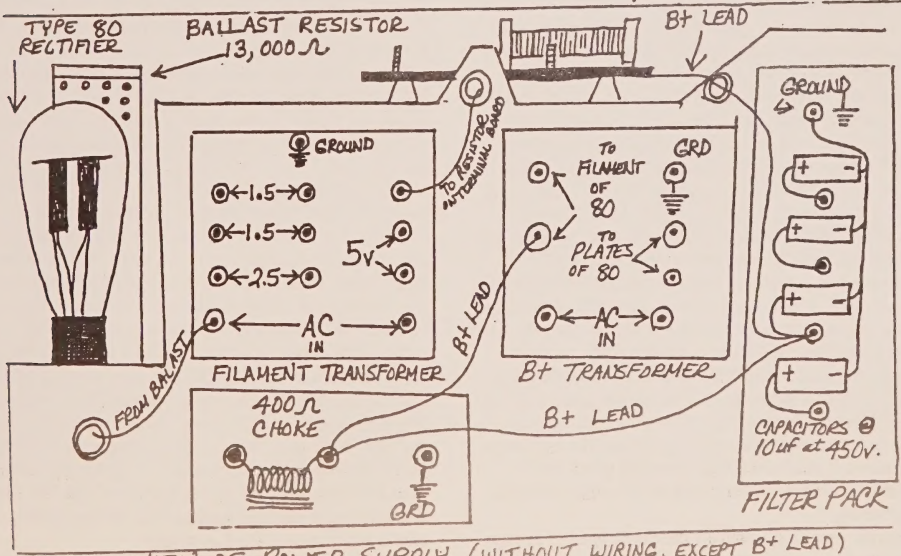
Before plugging in that power supply, make note of the following warning—**Never under any circumstances, is the power supply to be operated or plugged in without the chassis and speaker connected to it. Without the load, the B voltages will be unusually high (sometimes in excess of 500 volts) and will literally blow your filter capacitors!**—the author knows this all too well from experience.

If you've powered up you set and there is no sound, everything appears normal, you probably have an open wire-would resistor, located on the top of the power supply. There are three of them, and they have a notorious history of failing. The one I replaced in my set is the 1000 ohm one. There is also a 2300 ohm resistor as well as a 15,000 ohm one. If your set happens to be a later version, there will be a forth resistor with the value of 1000 ohms. These can be replace with 25 watt wire-wounds. If this fails to bring sound to your set, and your voltages seem normal (check them against figure 1A on the terminal card), you may have an open audio transformer.

If the set operates, but seriously distorts, check the grid-leak resistor off of the detector tube (type 27), located on the radio chassis resistor/terminal board in figure 1B, on the extreme right. It may have changed significantly in value or opened up completely, thus not creating enough bias for the 71-A output tubes. A 2.0 meg ohm resistor should cure this ailment. Fortunately I was able to get my Majestic model 71-B to operate will without any complications. So far I've enjoyed playing the set tremendously. It has ample power and good tone for this early of an AC operated set. for a TRF set, the selectivity is quite outstanding. I'm able to separate KDFC @ 1220kc, a classical

station which is sandwiched between two rather strong stations. Some of my better superhets have difficulty receiving that station. On the Majestic, though, it plays loud and clear with minimal interference. If that isn't the acid test for how well a TRF set performs, in this air-wave congested area, I don't know what else is!





SIDE VIEW OF POWER SUPPLY (WITHOUT WIRING, EXCEPT B+ LEAD) FOR CHASSIS -70 OR 70B

REJUVENATION OF VACUUM TUBES

Lane S. Upton

With the ever increasing scarcity of old tubes, it is becoming more important that we try to save as many as possible. Over the past two years I have been experimenting with the rejuvenation of these older tubes. This work has been based primarily on present day techniques used at Eimac and on data given in various books published in the 1920's Using the methods described herein, I have had approximately 85% success in returning inactive tubes back to usable transconductance. The failures have primarily been due to filaments being burned out during application of the excessive voltages required. The tubes which failed either had filaments that had been weakened from long hours of operation, or were marginal at the weld joints. None of these failures were opened for investigation as they are still valuable for display purposes.

The primary failure mode of these older tube types is a loss of electron emission from the filament or cathode. With the wide inter electrode spacing used in these tubes, a short is very rare except in the case of a broken filament wire where the oxide has flaked from the filament or cathode and has touched the grid. The loss of electron emission typically shows up in the tube tester as a weak tube or one which will not raise the meter needle. If a tube tests normal and does not show any erratic indication on the test meter, no attempt should be made to improve it by rejuvenation.

The equipment required for rejuvenation is relatively simple. In addition to a tube tester, a variable filament supply is required with a meter of reasonable accuracy for measuring the applied voltage. In place of a separate filament supply, a filament voltmeter may be connected to the tube tester and the filament voltage switch and "line" adjustment used for voltage control. For the thoriated tungsten filaments it is preferable that no grid or plate voltages be applied during rejuvenation. With the oxide emitter tube, voltages should be applied during rejuvenation. The removal of plate and grid voltages can be readily accomplished by the construction of an adapter socket with filament connections only. The voltage applied to the filament during rejuvenation mush be carefully controlled to the values given. The accompanying graph shows the results of various voltages applied to a thoriated tungsten filament during rejuvenation. It shows that a voltage lower than the recommended value will eventually result in a fairly good tube, while too high a voltage will result in a tube which will remain weak.

Emission loss is generally due to contamination (poisoning) of the emitting surface. The vacuum and the original outgassing of the elements in these older tubes was not near the present day standard, therefore, they contain considerable residual gases. The poor emission usually is the result of either the emitting surface being poor in storage, or, immediately upon being heated the filament/cathode was poisoned by the residual gases which had condensed on the emitting surface. The function of rejuvenation is to drive off these condensed gasses and to replenish the electron emitting layer on the surface of the filament/cathode.

Vacuum tubes have essentially three basic types of emitters. These are: pure tungsten, thoriated tungsten, or a directly or indirectly heated oxide. The type of emitter in a given tube can be determined by its operating color at rated filament voltage. The pure tungsten filament operated bright white, the thorated tungsten filament runs orange to yellow, while the oxide emitter operates in the dull red region.

The pure tungsten filament needs little rejuvenation as its operating temperature makes it self-cleaning. Operation at 110% of rated filament voltage for up to 30 minutes should clean them up. This type of filament was used in such tubes as the UV200, UV201, and in many types of transmitting tubes.

The thorated tungsten filament is probably the major one to be dealt with by the collector. This filament is a composition of tungsten and thorium with the tungsten acting as the heat source while the thorium is the emitting source. This filament was used in tubes such as the UX200A, UX201A, UV99, UX99, UX120, UX210, and in many of the later (and present day) transmitting tubes. Two methods are used for rejuvenation of these filaments. If a tube is only weak or gives erratic readings, the first procedure should be tried. If a tube is completely dead (but the filament lights up) then the second procedure should be used. 1) operate the filament at 135% of the rated voltage for 30 minutes. Test the tube, and if the tube has improved but is still not to rating, continue for another hour. If at the end of this time the tube is still not up to specification, use the following procedure. 2) In this procedure the filament is run white hot to strip the emitting surface completely clean, then the surface is restored using the above procedure. Operate the filament for 15 to 20 seconds at 350% of rated voltage with no other voltages applied. Then, operate the tube under the conditions given in the first procedure. Test the tube every 30 minutes, and if the tube is not up to rating after two hours, it has reached the end of its useful life. Note: Do not attempt to test the tubes at the end of the first step, as there will be no emission.

Typically the oxide emitter consists of a layer of strontium and/or barium oxide deposited on a heated surface. In the directly heated type, this layer is placed directly on the surface of the filament. Typical of this type are Western Electric tubes such as the VT-1 and VT-2 and the WD11, UX226, and UX280. The indirectly heated cathode is the more modern type of emitter consisting of a metal sleeve with the oxide layer on the exterior and the filament mounted in the interior. The indirectly heated cathodes include the ac heater types such as the 24, 27, and the Kellog tubes. These tube types should initially be operated at the rated filament voltage for at least one hour and then checked for quality and stability. If they still are not satisfactory, then the following procedure should be used. With the tube in the tube tester, increase the filament voltage to 120% of rating while carefully watching the plate current or tube tester meter reading. The meter reading will slowly increase, hit a peak, then start to decrease. At the point of maximum reading, reduce the filament voltage back to rated value. Continue to operate the tube at rated filament voltage for at least four hours, then test. When two tests spaced one hour apart provide the same reading, the tube is rejuvenated as much as possible.

The rejuvenation of the old tubes can be very rewarding espe-

cially considering that some of the would otherwise be in the junk box. It does take some time for this work as there are no short cuts, but it is something that can be done without constant attendance. While not all the tubes will come up to 100% or rating, at least many tubes can be brought up to the point of being usable. As these old tubes become more scarce this may be the only way we will have of getting the old sets operating.

RESTORATION HINTS

Helpful tips from CHRS members

QUICK PART REPLACEMENT

A quick way to replace capacitors and resistors in most sets can be accomplished in the following way: Cut out the old part by clipping the leads very close to the part itself. Take the leads on the new part and wind them around a piece of stiff wife, precision screwdriver, or test lead in the form of a lightly coiled spiral spring. The coil can then be slipped over the remaining portion of the original leads and easily soldered into place. This is much easier than struggling to unsolder the component form its original solder point, and often makes it easier to replace if it is located under other components and wires.
—George Murdock

A FACE LIFT FOR A DULL FINISH

Formby's Furniture Face Lift kit can often rejuvenate the original finish on most sets if the finish has dulled but is still intact and not alligatored. The rejuvenated finish can either be glossy or satin as the user desires. This often saves the time and trouble of complete refinishing.
—George Murdock

RESTORING THE ORIGINAL WOOD FINISH

Another excellent product for restoring the original beauty and depth to a wood finish without refinishing is Howard's Restor-A-Finish. When applied and rubbed with #0000 steel wool, the product cleans, removes scratches, watermarks, white rings, etc. Several colors are available, depending on the shade of wood that you're working with.
—George Murdock

ADDING LUSTER TO A PORTABLE SET

Ever wonder how to restore the luster to the airplane cloth used on many portable sets? A few coats of Future acrylic floor coating will make it shine again. First, clean the cloth with Fantastik or Formula 409 to remove dirt. Then wipe on the Future with a cloth and let it dry. It will soak in and become glossier with each coat. This will work on many other surfaces, too. Be sure to try it on an inconspicuous spot first. Future may be removed easily with household detergent and ammonia.
—George Murdock

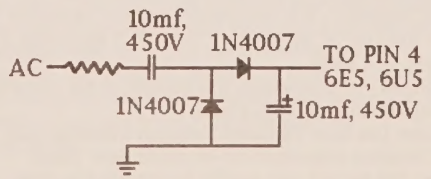
"EYE" TUBE HINTS

by Norman R. Leal, Livermore, CA

Good eye tubes such as 6E5 and 6U5 are getting harder to find. Many of the old ones still have filaments but have lost most of their green glow. You can increase the green by a slight modification of the circuit. These tubes were originally specified for operation on 250 volts. By increasing the voltage on the target, pin 4, on dim eye tubes they may again be useable. I have tested some weak "eye" tubes to 1000 volts and have not had a problem. To increase the brightness pin 4 should be connected to a higher voltage in the radio. If the radio doesn't have a higher voltage, the addition of a diode, capacitor and resistor should add around 100 volts. Most radios use an 80 for a rectifier. This tube has a high voltage drop and in addition, the rest of the radio circuit loads the voltage down .

Connect a 100 ohm resistor, for protection, to one of the 80 tube plates. The other end of the resistor to the anode of a diode (1000piv). The cathode of the diode should go to the positive end of a 10 mfd 450 volt cap. The negative end of the cap goes to ground in the radio. Now remove the wire which connects pin 4 of the eye to B+ and connect pin 4 to the junction of the diode and 10 mfd cap. The actual voltage on the eye will be slightly less than 1.4 times the AC plate voltage on the 80. The higher the voltage on the eye tube, the larger the AVC voltage needed to close the eye. The 6E5 tube is more sensitive than the 6U5 or 6G5 and will have more movement when tuning in a station. If you notice no movement of the eye when tuning in a strong station, either the AVC voltage is missing or a small 1 meg resistor built into the 6E5/6U5 socket is open. This resistor is between pins 2 and 4 and needs to be replaced if it is open. A voltage doubler can be used on a radio that doesn't have a high enough AC voltage such as AC/DC radios. The doubler can be made up of two diodes and two capacitors. Again, a resistor should be used for protection.

The 1629 tube can be used to replace 6U5, 6E5, 6G5, etc. tuning eyes if you make an adapter and increase the filament voltage to 12 volts. At first it seems like another filament transformer must be added but this is not necessary. The 1629 as well as most tubes will operate on AC or DC for the filament voltage. For AC radios you can make a simple voltage doubler that will convert the 6.3 volt filament of the original tuning eye tube to over 12 volts DC for the 1629. To make the doubler two 470 mfd capacitors and two 1N4001 or similar diodes are required. See the diagram below:



USING TYPES 30 AND 31 AS REPLACEMENT TUBES

Norman R. Leal, Livermore, CA

The 30 will replace 01A, X99, WX12 and most other amplifier tubes which have "4D" basing. The 31 will replace 20 and 71A in early battery sets.

As long as the sockets in the radio are not dependent on the side bayonet pins and you are willing to change the filament voltage, the 30 and 31 tubes make excellent replacements in early battery radios. These tubes are presently available new at reasonable prices.

Early radios usually have a rheostat to control the volume. This rheostat will not have the same action when using 30's as replacement for the higher filament current 01A's. To correct this, you can either add a load resistor across the filament pins in the radio or use a variable supply for the filament. In any case, the performance of the radio should improve as the 30 and 31 have slightly higher gain than the other tubes.

Tube	Fil V	Amps	Plate V	Ma.	Grid	Gain	mmho	Plate res
015.0	1.0	90.0	2.5	-4.5	8.0	725	11,000	
01A	5.0	0.25	90.0	2.5	-4.5	8	725	11,000
01B	5.0	0.125	90.0	2.5	-4.5	8	725	11,000
12A	5.0	0.25	90.0	5.0	-4.5	8.5	1,575	5,400
X99	3.3	0.063	90.0	2.5	-4.5	6.6	425	15,500
WX12	1.1	0.25	90.0	2.5	-4.5	6.6	425	15,500
302.0	0.06	90.0	2.5	-4.5	9.3	850	11,000	
312.0	0.13	135.0	8.0	-22.5	3.8	925		
203.3	0.132	135.0	6.0	-22.5	3.5	600		
715.0	0.50	135.0	17.0	-27.0	3.0	1650		
71A	5.0	0.25	135.0	17.0	-27.0	3.0	1,650	
71B	5.0	0.125	135.0	17.0	-27.0	3.0	1,650	

The above data was taken from a 1957 CBS Tube Manual and only shows operation at a specific plate voltage and will be shown that way in tube manuals.

Advantages:

1. Cost — The tubes are available new at reasonable prices.
2. Uniformity — Electrically and mechanically the 30/31 are more uniform. You will not need to move tubes around to find which ones work best in which sockets. It is easier to find a set of tubes that have the same physical appearance.
3. Microphonics — Microphonics will be reduced.
4. "A" Supply — It is much easier and less expensive to build an "A" supply for 2 volts @ .5 amps than 5 volts @ 2 amps.
5. Overall — Performance will improve as the gain per stage multiplies not just adds.

Tubes that have Thoriated-Tungsten filaments with low emission sometimes can be reactivated. These tubes, like the 01A, can usually be identified by their bright filaments.

Test a weak tube then operate the filament at a slightly increased voltage without plate potential for a few minutes and retest at the original setting. If there is some improvement, again apply the increased filament voltage for an hour or so and note the improvement. In some cases, it may take overnight for maximum recovery. If no improvement was noticed, use a slightly higher filament voltage.

The 01A operates with 5 volts on the filament. A voltage of 5.5 to 6.0 is usually enough to increase emission. Do not go above 6 volts as this can have the opposite effect reducing emission and can burn out the tube. I have had the best success with RCA and Cuningham tubes sometimes bringing the emission to the level of new tubes. Some tubes will not recover.

Emission in some other tubes like the 26 and 71A may also be improved by a different method. On these after testing make the tube draw excessive plate current. This can be done by making the grid positive and increasing the filament voltage if necessary. This can be done on a tube tester like the EICO 666 or other setup capable of high current.

Under these conditions the plate current will start to increase. In the case of the 26 and 71A, a green color may appear between the filament and plate. If the green color is noticed, the tube probably has increased emission. Do not keep these high current conditions on the tube for more than a minute or so. Remove power, let the tube cool and retest.

Distortion in a radio is generally caused by leaky audio coupling capacitors. Even the slightest leakage can cause a problem and if not corrected will damage the output tube and can overheat the power transformer.

The plate of one stage is coupled to the grid of the next with a capacitor. The plate has a positive voltage while the grid requires a negative bias. A leaky cap causes the grid to run positive and the tube to draw excessive current.

To determine if this is a problem, measure the grid voltage in relation to the cathode of the tube using a high impedance meter, 20,000 ohm or VTVM, as not to load down the voltage. For most AC/DC radios, the

voltage on the output tube grid should be -6 to -8 volts. For radios using 6F6, 42 or other tubes with higher voltage on the plates, the grid voltage will be –15 to –20 volts. Some tubes like 45's and 71's may have –50 volt grids but these are usually transformer coupled.

If the grid voltage isn't negative enough or is positive replace the coupling cap. Use a good quality cap which shows no measurable leakage on the highest scale of an ohmmeter. Most radios use caps around .01mfd. A radio will have a better low frequency response if a larger value is used, .05 to .1mfd.

At the same time, the cap is being replaced check the grid resistor. The grid resistors on the output tubes should not exceed .5 meg. Some resistors increase value over time and some radios used values exceeding .5 meg which is not recommended for most output tubes. If the resistor reads high replace it with one of the same or lower value.

TECH TIPS

LIGHTING IN MY RADIO?!

A lot of us collectors have a few old lightning arrestors or antenna grounding switches in our collections. But how many of us are using them? Lightning is as dangerous now as it was in the early days of radio.. EVERY outdoor antenna should have an arrestor or switch attached to it. This is especially true if your antenna is out in the open. While the chance of your antenna being struck by lightning is remote, the effects of even a nearby hit are devastating. The damage to your equipment, house, and even you can be beyond. imagining. Be safe, and— authentic. Install a lightning arrestor or antenna grounding switch soon and NEVER handle electrical equipment during an electric storm. Make sure that the ground used for the arrestor /switch is separate from the one you are using for your radios! Also note that any nearby lightning strike can overload and burn out modern FET or CMOS front ends. Use an old lightning arrestor or switch to save your new gear as well. —PJB

RESTORATION HINTS

Helpful tips from CHRS members

BROWN CLOTH LINE CORDS

If brown cloth-covered line cord is no readily available, one can make a satisfactory substitute by dyeing the gold or white modern cloth cord with a dark-colored wood stain.
—H. Brams

INTERMITTENT WIRE-WOUND RESISTORS

Many intermittent problems in radios arise from defective cloth or metal-covered wirewound resisters which open up when they become warm. Replace 'these as necessary.
—H. Brams

RATTLING SPEAKERS

Buzzing or rattling noises in speakers may arise from material that has become trapped between the rim of the cone and the frame or the speaker at the rear of the cone.
—H. Brams

HUM PROBLEMS

If a power transformer is replaced in a set, the sound may sometimes become garbled or a hum be heard. Bypassing the 117 VAC primary leads to ground through 0.01 mfd 600 V capacitors will often eliminate this problem. also, shielding the lead from the volume control to the first audio tube reduces hum in many sets.
—H. Brams

REPLACING PARTS IN PHILCO RADIOS

Restoration of Philco radios is generally tedious because the capacitors are mounted inside small Bakelite blocks. Removing these blocks leaves holes in the chassis which spoils the appearance of the set. The following procedure allows one to clean up the wiring to a considerable degree without changing the outside appearance of the set. Cut off the tubular part of the capacitor block through which the screw goes and use these as spacers for mounting terminal strips. Pass the original screw through the strip, then through a lock washer and then the spacer. Then mount the assembly in the original hole.
—H. Brams

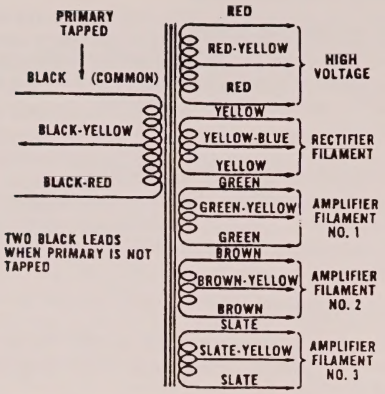
RUBBER-COVERED DRIVE WHEELS

The rubber rims of drive wheels can often be replaced by belts or O-rings. There are various sources for these, such as plumbing supplies, tape recorder parts, auto stores, sewing and vacuum repair shops, etc. A good source of O-rings is the R. W. Scott Co., 2345 Fourth St., Berkeley, CA 94710. One should lift the O-ring onto the rim of a wheel rather than rolling it on. otherwise, it may have tendency to roll off under use.
—H. Brams

LOOSE TUBE BASES

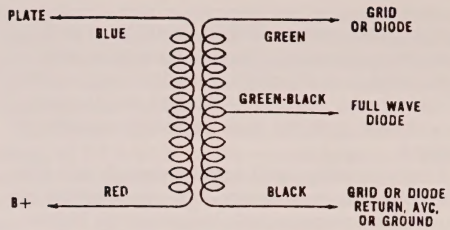
Loose tube bases may easily be re-attached to the glass bulb with the new instant crazy glues. The glue sets quickly and no unsightly glue lines remain.
—H. Brams

EIA Color Codes

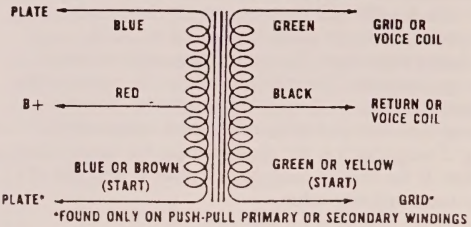


POWER TRANSFORMER

I-F TRANSFORMERS

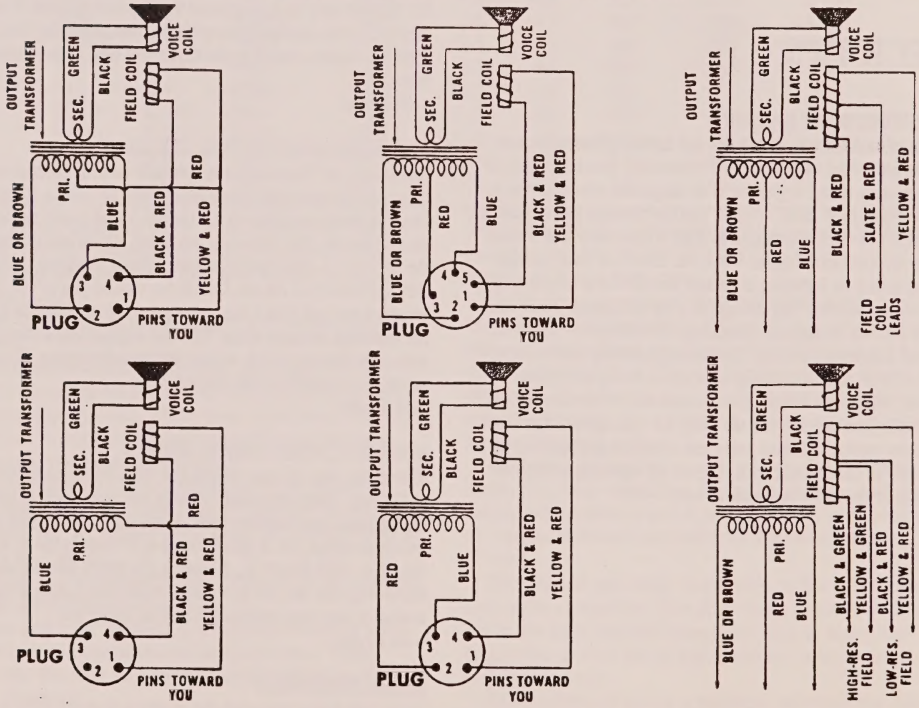


AUDIO & OUTPUT TRANSFORMERS



*FOUND ONLY ON PUSH-PULL PRIMARY OR SECONDARY WINDINGS

SPEAKER LEADS AND PLUG CONNECTIONS



CHICAGO STANDARD TRANSFORMER CORPORATION 3501 ADDISON STREET CHICAGO 18, ILLINOIS

THE LYSOL SOLUTION! Quick Clean-Up on Old Finishes

Ed Sharpe, Phoenix, AZ

One afternoon at my computer business, I took some time out to clean up some old wireless gear I had sitting in the backroom. Since some of this equipment hailed from storage sheds (with lots of mouse crap on it!), I wanted to make sure it was disinfected as well as clean.

I got my usual supply of cleaning implements out along with a spray can of Lysol disinfectant. I suppose it was thus quite by accident that I discovered a new unit for Lysol.

Lysol when sprayed on a rag and rubbed over a messy dirty finish, will clean the dirt off, as well as soften and strip just a small layer of the top of the finish. The effect of this is to clean the item and also soften and slightly blend the finish so that small cracks and nicks get covered over.

I believe that Lysol has it's cleaning effect due to the alcohol that is in it.

I find this technique really useful when working on old pieces of pre-1920 wireless gear that are mounted on wood bases that I want cleaned up but do not wish to strip and refinish. It is great to have an old piece of equipment looking cleaned up, but really out of place if it is refinished to the point it looks like it has just come from the woodworker.

Do not use this technique to clean something that has a nice lacquered Piano finish that can be cleaned by other methods, because it will diminish the finish.

I am not certain that the above mentioned technique can be used on all finishes, but has been highly successful on some of he old equipment I have used it on. I would suppose the best bet is to try it on a small hard to see part first.

Not only does this 'Secret Process' clean, but it will also kill germs and fungus that might be living on that fine old piece of wireless gear. It is real good for mouse crap.

There are times that I have achieved the same effect as what the Lysol does by using Acetone or Lacquer thinner. The effects of these two substances is more pronounced than the effect of the Lysol, but there are two disadvantages to these two substances. The first is that they are so fast acting that you can quickly damage a finish when you least suspect it. The second problem is that both of these substances are extremely harmful to the body if they are breathed or come in contact to your skin.

Many of the substances that we use to clean old equipment can cause many health problems, either in the immediate mode, or many years later after continuing periods of exposure. Read the warning labels of all of these products, and figure whatever they say will be an understatement, as undoubtedly years from now they will have discovered additional undesirable effects from a product.

TIPS FOR SAFE USE OF SOLVENTS AND CLEANERS:

1. Work in a well ventilated area, or better yet, outside!
2. Wear gloves to keep physical contact with cleaner or solvent to a minimum!
3. Don't spill any of the cleaner or solvent on yourself, and if you do immediately flush the area of contact.
4. Wear a set of safety goggles not only from the front, but also from the sides. These are available in any store that sells shop tools. REMEMBER — Wearing glasses will not save your eyes of something splashes in from the sides. In case you get some radical solvent in your eyes, flush with water and seek medical attention immediately. Have a hose ready before you start to work.
5. Since many solvents and cleaners are extremely flammable:
   A. Do not smoke when using them!
   B. Do not use near any open flame!
   C. Do not use them near a heater!

COMMON SENSE:

The basic thing is to use common sense. If you do not have any common sense there are two things you can do to remedy the situation:

1. Have some one else use cleaner or solvents for you.
2. Imagine the following either as a separate incident or happening at once:
   A. Cancer of the liver
   B. Kidney failure
   C. Total blindness for the rest of life
   D. Your house burning to the ground
   E. Your favorite radio burning
   F. Brain damage
   G. Various other forms of cancers causing:
      (i). Death
      (ii). Body Darts having to be amputated
      (iii). Generally overall disgusting appearance

I am sure at this point after visualizing one or more of these bizarre happenings you will acquire common sense. The same rules mentioned in this article also hold true for finish products such as lacquer and varnishes.

[*Editors' note: Also be careful sanding or filing an old chassis. Cadmium was used to plate the steel so that wires could be soldered on. Cadmium is a very poisonous heavy metal, worse than lead. If you can't remember your name or see straight after an afternoon (or a decade) of restoration work, you should have more adequately ventilated, gloved, goggled and washed.*]

RESTORATION HINTS

Helpful tips from CHRS members

CUTTING SCREWS

When a screw must be cut to a certain size, first put a nut on it. After cutting the screw, make the cut end slightly pointed with a metal file, then remove he nut. The screw will now easily enter its appropriate hole.

—H. Brams

KILLER FIBERS AND DEADLY OIL IN MY RADIO !?

Ed Sharpe, Phoenix, AZ

With all the outcry about the dangers of asbestos in the press these days, we maybe ought to examine some of the items we collect for this substance. Doctors tell us that asbestos causes lung problems. Its fibers embed themselves into our lungs and do not ever go away. Then they cause cancer. Asbestos will just sit there, only later to haunt us with this malignant disease, especially if we smoke.

For those of you who have somehow missed the news on all of this, many things around us have asbestos on them. Let's take a look to see how many we can find in our workshops and radio collections. Older brake shoes had asbestos in them. Remember how you used to blow that dust out of your brake drums when you had the drum off the axle to examine the brake shoes? Beware of tape around heater ducts. This will look like a gray cardboard, but cardboard it is not: It is asbestos! These are two easy forms to find.

Let's take a look at our radio collections and see what we can find. In many older radios, asbestos was used to keep the heat of the tubes from ruining the top of radio cabinets. This will be gray-ish substance, and can be in

either of two forms. Sometimes we find it as a hard gray material almost like a piece of plywood, but with that familiar gray color to it. In other cases it can be softer like a sheet of soft cardboard. EITHER FORM IS DANGEROUS!

We can also find asbestos in the old resistance type line cords that drop the voltage going to the filament circuit of the radio in question. Of course by now, many of these once useful cords are now fraying This will expose the asbestos fibers to the air, and any movement of this cord will cause asbestos fibers to become dislodged and become airborne. Yep! They are now headed for your lungs! Especially if you breathe.

Some ballasts will merely consist of some resistance wire wound on an asbestos form. I can also remember some electrical and radio equipment that used this form for voltage dividers in the B+ section of the power supply. You need to beware of these!

Do not confuse mica with asbestos; they are clearly different, both in color and level of harm. Mica, I do not believe, will have any harmful effect on you, whereas asbestos will be gray-ish in color and is harmful. Mica will also be transparent and look almost like plastic or layers of glass that is laminated.

THE OIL OF DEATH!

Much has been in the news lately about the danger of a chemical substance named PCBs (Polychlorinated BiPhenols). In the Thirties, Forties and even later, these substances were used as an additive for oil filled capacitors to increase their breakdown voltage level. Now you may be asking how this affects you as a radio collector, right?

Yes, many of those oil filled capacitors in your favorite old radio and audio equipment have PCBs contained within the oil that is used as a supplement for the dielectric. Yuk!

Some of the most dangerous accumulations I have seen of these type of oil filled capacitors are in World War II military radio equipment. These capacitors will rear their ugly little heads in both receivers and transmitters. When these capacitors were manufactured they were high reliability JAN-spec components: however, with the passage of time, these units begin to leak, oozing oil from around the seals on their terminals. The round, black capacitor with the stripes around them (similar to resistors) also are oil filled and common in post-war radios, TV's and audio equipment

I would not advise disposing of these old capacitors by merely throwing them away, as once they get covered over by dirt in the city dump and the rain falls on this dirt the PCBs will be driven straight into the water table for you and your children to drink. Instead a discrete inquiry of your. local branch of the EPA or your state government's hazardous waste department will tell you a safe place for the disposal of these carcinogenic little, devils! Be discrete inasmuch as you would just as soon avoid a full fledged EPA raid on your radio collection construed as an illegal hazardous waste accumulation!

TECH TIPS

NEW DIALS FROM OLD!

Member Chris Buttery has come up with a great way to replace radio dials that have been damaged or cracked or even are missing. If the dial is missing or severely damaged, you will have to borrow one from someone else who has the same make and model of radio. In fact, it will save you time if you can borrow one. All that you need is access to copy machine. If the dial is damaged, make a copy onto regular white paper and touch it up using white-out made for copies. You can even draw in parts that are missing. Take the good dial, or the copy, and make a copy of if onto clear plastic made for overhead projectors. This material is made to be used in copy machines. You will now have a perfect copy on clear plastic.

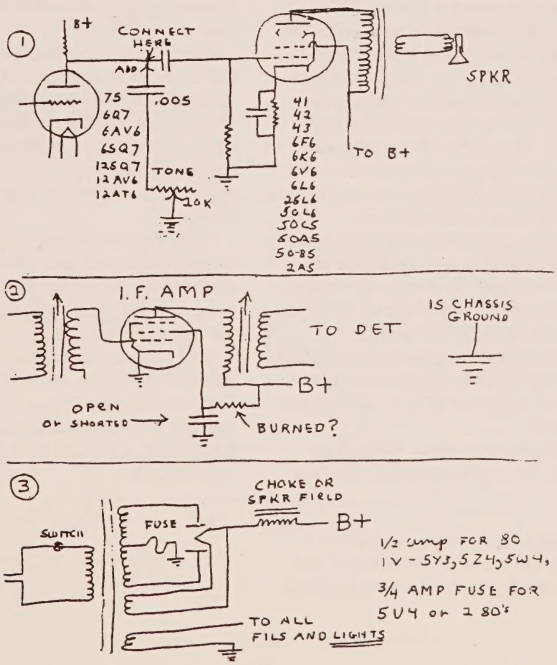
This dial can be backed onto paper of the correct color. Parchment paper comes close to the color of many radio dials. For glass dials that had white lettering, use a piece of paper that matches the background color of the set behind the glass dial when copying. You will have a dark background with clear lettering. This can be backed with a white (or other colored) piece of paper. There are many off white colored papers that should work. The dial can then be sandwiched between two pieces of thin glass and the glass bound with slide binding tape found at photo supply stores. With a little creativity, you should be able to duplicate a lot of different dials. With color copying, now readily available, and of quite good quality, there are even more ways to create old dials. Chris made a dial reproduction for me that was quite extraordinary. Many thanks to Chris for a wonderful idea! —PJB

TECH TIPS

Jim McDowell

1. You need a 50B5 and need it now!. All you have to do is reverse pins 1 and 2 and reverse pins 5 and 7, and now your set will use a common 50C5 tube.
2. If you need a 25A6 you can just plug in a 25L6.
3. No matter how well a radio seems to play always replace the coupling capacitor between the first and second audio on pin 5 of octal tube types and pin 4 of 41, 42, 43, type tubes. This capacitor most often leaks and will distort the sound after the radio gets warm. Also replace the tone capacitor on pin 3 of octals or pin 2 of 41 type tubes. You may also remove this capacitor if you want more treble.
4. To protect a power transformer in a set, install a one-half amp fuse between the high voltage secondary center tap and ground. In some sets the secondary does not go straight to ground. In this case, place the fuse between the secondary center tap and the rest of the circuit. It is also a good idea to check all dial light wires. (See diag. no. 3)
5. In late twenties and early thirties transformer coupled push-pull type sets (some dog coffins) the tone can be greatly improved by placing a .01 capacitor in series with a 10K pot and connecting the leads to the control grids (first grids of output tubes) and then adjusting it to your taste. This adjustment works in the mid frequency range and will enhance the lows and highs if adjusted properly.
6. Tone controls may be added to any radio! To do so add a .005 mfd. @ 600 volt capacitor from the plate of the first audio amplifier through a 20K pot to ground.
7. Switches that you can't seem to get clean will clean up using Blue Stuff. a TV tuner cleaner sold only at electronics parts houses (in San Francisco. ARDCO, 1583 Howard St., They also supply a lot of other things that we need to repair old sets). This will also work on controls as well. Radio Shack has lots of stuff like this, and a selection of high voltage capacitors, and 1/4 watt resistors as well
8. Weak reception on a superheterodyne set may be caused by open bypass capacitors in the I.F. stages. (See diag. no. 2).
9. Those valuable little metal sets can be made safe to operate by using a grounded three wire cord and plug. Just replace the old cord with the new one and ground the third center wire to the cabinet. Make sure the cabinet is grounded by connecting an ohm-meter to the cabinet and the third (big) prong. Use these sets only on a grounded outlet.
10. Old FM band 43-48 mHz sets can be useful still to pickup TV sound. Connect the antenna of the radio to a metal plate under the TV set and tune the radio until you hear the TV sound. The sound will change as you change channels on the TV. Some TV's are so well shielded that you may have to open up the TV and glue a small piece of metal on top of the video I.F. chip and run a wire to the FM antenna terminal, Do not make any direct electrical connections to the TV!!

Have Fun!



IMPROVE THE PERFORMANCE OF YOUR AC/DC SETS

John Eckland

Below are some useful circuits for improving reliability and performance of AC/DC sets using resistance line cords or ballast tubes. In some cases a partial or complete tube line-up change would be necessary. These changes are recommended for sets intended for continual or daily use. These conversions also apply for 'battery' editions of conventional AC/DC table sets. I recently received a Crosley bakelite table radio of the "American/Overseas" variety. Instead of the usual AC/DC or AC tube lineup, this set was to operate on dry batteries; 90 VDC for the plate supply and 1.5 VDC for the filaments. The tube complement was typical for a set of this type: 1A7, 1N5, 1H5, and 1A5. Here's how this butcher job began (AC radio renegades listen up!) I pulled out a chassis punch and removed the $^3/_8$" slug for the rear apron of the Crosley chassis. I then installed a rubber grommet and threaded through a hank of 18 gauge zip cord, tying a knot in it. Next I installed a double 8AG fuse holder nearby on the inside apron and soldered the cord to one side of the holder. I could continue on, step-by-step, however I trust the following schematic will suffice.

Anyway, I selected a 6A8 to replace 1A7, a 6K7 for 1N5, a 6SQ7 for 1H5, and finally a 6Y6GT/G for the 'wimpy' 1A5 output tube. I fitted the set up with a new speaker assembly. Originally a 5" permanent magnet unit with a 25K Ohm/4 Ohm output transformer (very difficult to locate today) was used. Now the speaker is 5"x7" with a 4 Ohm voice coil and a 2000 Ohm to 4 Ohm output transformer. The latter is much easier to find.

I could have selected tubes for use in series string, however I chose tubes for use in parallel to minimize 'flashing' of the heaters during initial powerup. As I feel this greatly reduces the lifetime of tubes as well as pilot lamps. This undesirable flashing of heaters and lamps also occurs in sets with diode replacements for resistance line cords or ballasts. The optimum filament transformer selected to operate these tubes and several pilot lamps is rated 6.3 volts AC at 3 amps. In this particular chassis there is plenty of room to mount a filament transformer, output transformer and filter choke. These parts can be obtained from swapmeets and junked sixties' vintage table sets.

I used a 6Y6 output tube for compatibility with extant output transformers in most AC/DC sets, its copious supply and awesome power output of up to 3.6 watts! To improve the tone quality replace the volume control with a tapped type (as shown) as well as application of inverse feedback (also shown).

I cannot overemphasize that these sets present a shock hazard and must not be operated near a sink or any grounded appliances. I affix a sticker on the back of all AC or AC/DC table sets and inform the owner as well.

Photos of the completed chassis are shown. Although the radio is no longer 'original' the set plays beautifully now, and was fun to restore.

John Eckland restores vintage radios, televisions and hi-fi equipment as his vocation. He likes to 're-engineer sets', and has been involved in the old radio hobby since early childhood.

AC/DC Safety

Bill McGowan
Costa Mesa, CA

I read John Eckand's Article "Improve The Performance of your AC/DC sets." John rebuilt a Crosley Farm Radio.

In its original condition the radio did not present an AC shock hazard, as it was a battery set. John's article states several times that this chassis presents a shock hazard. But if you look at the schematic it is more than a shock hazard.

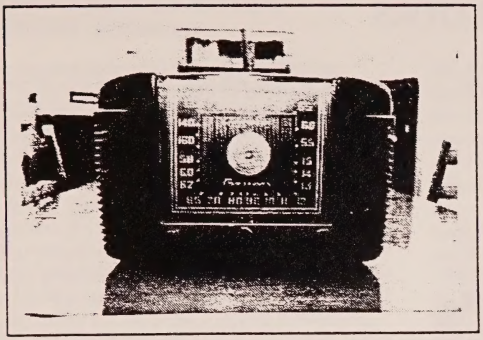
It is deadly. One side of the AC line goes to the chassis via a lamp fuse and the on-off switch. If the AC plug is inserted into a non-polarized wall outlet the wrong way, the chassis is at 117 VAC above ground. There are a lot of old houses which do not have polarized AC outlets. I have seen AC cords with non polarized plugs. Also, the face that a wall plug is polarized does not mean it is wired correctly. John added a 6.3 VAC filament transformer, a choke, and a new output transformer, which was a lot of work. He ended up with a deadly chassis. One solution would have been to use a standard power transformer with a 3 AMP 6.3 VAC filament winding. By using a bridge rectifier he could eliminate the choke, because he would now have full wave rectification. The choke would be replaced by a resistor of the right value and wattage to achieve the DC voltage required. The value of resistor would also depend on the AC secondary windings of the new transformer. I would try to buy one at an electronic swap meet. In that case, you really do not know what you are buying, but sometimes the values are printed on the case.

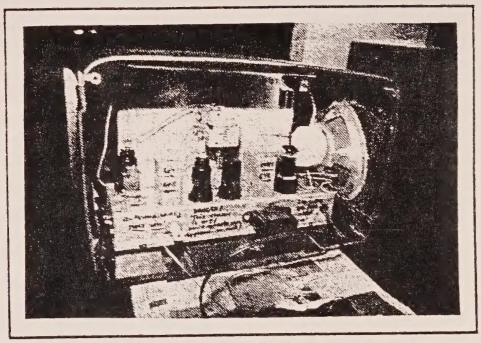
I have Westinghouse Model H-147 built in 1947. It is a standard 5 tube set using miniature tubes. I recapped the set and was surprised to see that I had a deadly chassis. See the schematic. Westinghouse must have realized it was a deadly chassis, as they used double-pole, single-throw on-off switch. I wonder how many people received the shock of their life when the set was on. (In 1947, polarized house wiring was not used as far as I know.)

I believe the easiest thing for me to do with this t is to lift the chassis grounds and install a floating ground buss. The floating ground buss is then connected to the chassis via a 150K resistor and 0.1 uFd cap. Philco was using this method by 1951. This circuit reduces the current to a safer value.

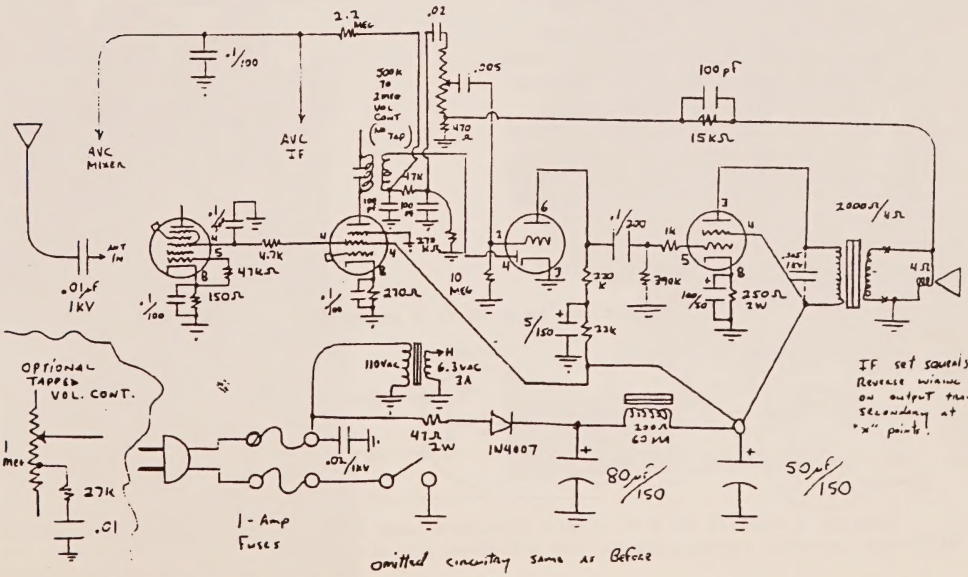
In all cases, anyone repairing AC/DC radios should use an AC isolation Transformer, which can be obtained from Antique Electronic Supply in Tempe, AZ. This will prevent you from receiving minor shocks if the capacitor from the floating ground buss is good, or a deadly shock if it is shorted.

Good Luck.





6A8 6K7 6507 6Y6 GT/G



omitted circuitry same as Before

CPR FOR AUTO RADIO VIBRATORS

Larry Drees

From the Northern California Newsletter of the Cadillac La Salle Club, Vol. 92, no. 19.

If your "pride and joy" dates back to the mid '50s or earlier, chances are that its radio is "blessed" with a vibrator power supply. The vibrator internally works much like a door buzzer. When power is applied to its coil, the armature is attracted to the coil. The first contact closes, shorting the coil and the coil loses its current. As a result, the magnetic attraction ceases and the armature springs away from the coil. The second contact then closes. This occurs approximately 115 times a second. This action is used to "fool" the power transformer into thinking that alternating current, AC, is 'applied to its primary, by alternately grounding each end of the primary with the battery supply connected to the center tap of the power transformer.

When your radio has not been used for a long period of time, the vibrator contacts may oxidize and leave you with silence instead of the familiar hum of the vibrator and the sound of your favorite "oldies" station. When you finally find that spare vibrator you wisely stashed away ten years ago, you find that it also fails to function. You may be able to coax one or both of the vibrators back to life using a simple trick I learned some years ago from Carl Larry Steig. Carl credits Skinned Knuckles magazine as his source.

THIS DISCUSSION DOES NOT APPLY IF YOU HAVE INSTALLED A SOLID STATE REPLACEMENT FOR YOUR ORIGINAL TYPE VIBRATOR. Solid state vibrators are notoriously unforgiving of even momentary overloads or incorrect polarity. Do not use them to troubleshoot another defective radio. The buffer capacitor should always be replaced before a new vibrator of either solid state or original type is installed.

The 6- or 12-volt battery supply is not sufficient to break through the undesired oxidation on the contacts. The application of 120 volts AC (with current limited by a 60 watt light bulb) to the contact connected to the vibrator coil will often break through the oxide. The lamp should glow at about 1/2 of normal brightness as each vibrator contact is closed less than 1/2 of the time. A pulsing of the lamp brightness is often seen as the vibrator frequency of approximately 115 Hz. beats with the 60 Hz line frequency.

A second 60 watt lamp connected to the second (non-coil) contact of the vibrator will remove the oxide from it. This is important, because although the vibrator may vibrate, loss of the second contact would result in a low D.C. plate supply voltage. Both lamps should glow at approximately equal brightness.

A NOTE OF CAUTION: Remove vibrator from the radio for these tests. Always unplug the 120 VAC when making connection to the vibrator. Keeps hands clear of the vibrator when the 120 VAC is applied. Do not leave the 120 VAC connected any longer than required to remove the oxide to lessen the chance of damage to the vibrator. (Using an isolation transformer and a ground fault circuit interrupter are also good ideas.)

Diagram A shows the connections to a twelve volt, three prong vibrator used in 1953 and later radios using vibrators. Diagram B applies to six volt, four pin vibrators used from 1940 through 1952. Note the two different internal connections and two different pin diameters. Cadillac used several types of synchronous vibrators prior to 1940. The contact arrangements are too varied to cover in this article. These vibrators use a second set of contacts instead of a rectifier tube to produce the plate supply voltage. The second set of contacts must also be free of oxide to produce the proper plate voltage. The same testing principles apply to these vibrators. One lamp is used to find the contact associated with the coil and make the vibrator vibrate. The second lamp is used to "clear;" each of. the remaining contacts in turn. Mark the installed position of the vibrator before removal from the radio as some of these vibrators can be rotated 180 degrees, which will result in the wrong polarity of plate supply voltage and non-operating of the radio.

Diagram A shows the connections to a 12 V. 3 prong vibrator used in 1953 and later radios using vibrators.

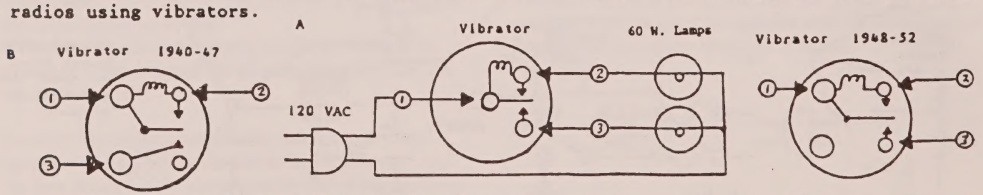


Diagram B applies to 6 V. 4 pin vibrators used from 1940 thru 1952. Note the two different internal connections and two different pin diameters.

RESTORATION CORNER

Bart Lee, xWPE2DLT , San Francisco

When you've stripped and sanded that radio down to bare, thirsty wood, wood that has needed help for maybe sixty years, several alternatives present themselves. It is possible to recreate that French polish finish, but it is an heroic endeavor. Polyurethane is available by the gallon, but it is a sin. A middle course is, however, readily at hand. There is a bottled wood stain with a dab-on applicator sold under the brand name E-Z Scratch Remover. It is a red-brown stain, nearly cherry. Unlike pigment stains, E-Z pervades the wood fibers (especially thirsty fibers), not only at the surface but to some depth. A bottle will do several radios. The result is deep patterns of grain and texture. On a good veneer, the wood glows with depth. This is not the reflective depth of high polish, but rather an inner depth as the stain variously highlights different wood fiber patterns of the grain. It is a most pleasing result, especially for a basket-case cabinet.

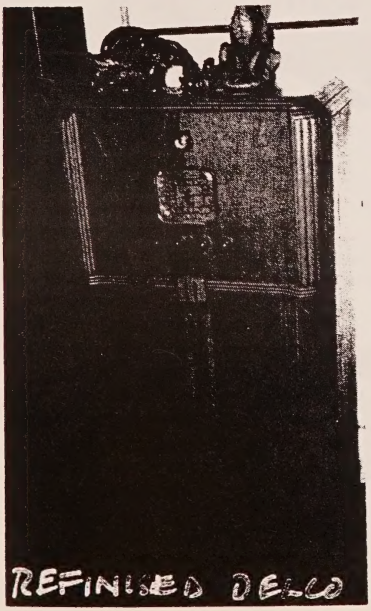
The two radios appearing nearby have had the benefit of this treatment. The Zenith chairside was deeply ringed from what I hope was many a happy highball imbibed while listening to the BBC. The console was the worst radio I've ever seen at a swap-meet; peeling veneer, waterstained, sunburned, warping and cracking. After sanding and steel-wooling to bare wood all around, I followed the E-Z stain with red-oil furniture polish. When the wood is old and dry, this does not leave an oil residue after serious soft, dry cloth buffing. Elbow grease will prevent a greasy-appearing surface. The result is the stain's glow sustained by the polish. Try it first on an old radio with nothing left to lose. You will be pleased.

Although polyurethane is generally a bad choice for restoration, it does have its uses. In the console pictured here, a Delco from 1937-38, the top was warped, cigarette-burned, ringed and desiccated. I took it down to bare wood, filled it, stained it, and then coated it with tinted polyurethane. This created a thick protective surface on the top of the console. Polyurethane can also be used underneath to counterwarp a bent wood piece. If I'd had a piece of beveled glass to fit the top, I might not have been tempted to use the polyurethane. The technique did work, however, and the top is nearly indestructible, and it looks good, too.

The knobs are also coated with polyurethane, on the theory that they get the most interaction and need the most protection. This radio, fully restored electronically as well, is working, albeit retro, house furniture. (I earned my Radio Yugoslavia QSL card on this radio in my living room, shortly before Yugoslavia discombobulated). If polyurethane coatings had been available to furniture makers in the thirties, I think they would not have hesitated to use them for protecting tops and other at-risk surfaces of wood radios. Go, likewise, and feel free to do the same.

For those of you interested in electronic restoration of 1930s and 1940s radios, there appears nearby a diagnostic chart. Mechanix Illustrated provided it in its RADIO MANUAL at the beginning of World War Two, a time when repair was the only option, no new sets being manufactured because of the war.

Today's restoration dilemma is capacitor replacement: all or only the bad ones. I replace them all, because it is only a matter of time until another paper cap goes. May as well do it all at once, and keep the radio going another forty years! If there's time enough, sure, put the new caps into the old paper cylinders.



REPAIRNING MAGNETIC CONE SPEAKERS

Jim Cirner

Prior to 1927, most speakers were of the "magnetic" type as opposed to the now used "voice coil" types. The method of repairing these old magnetic speakers is becoming a lost art.

However, assuming that the magnet coils are good, you may proceed with the following information.

For repair of crushed or torn cones such as the Crosley Music Cone speaker, remove cone from speaker. If cone is crushed, dampen with water until paper is pliable and iron it. Set iron temperature control at low heat and iron cone to proper shape on the underside until dry. Don't iron a dry cone or you might scorch or burn it. Glue, sparingly, small tears with G.C. speaker cement on underside of cone. If tears are large it might be necessary to glue a patch to the underside of tears. I use blotter paper for patching material.

Some speakers' motor mechanism parts are made of pot metal and often are cracked or totally broken. I remove all pot metal parts and coat the entire part with 12 to 24 hour-setting-up time, gray or clear epoxy. If entirely broken I glue broken sections together with 5 minute-setting-up-time epoxy and use the 12 to 24 hour type to fill all the tiny cracks in the pot metal parts. After the epoxy is dry I file excess epoxy off of parts and file parts into proper shape.

If you have to remove the permanent magnet from the motor assembly, put a nail across the magnet to help hold the magnetic field.

Since I don't have any pictures of the internal structure of the Music Cone speaker, I am going to use a Model 100A drawing out of a RCA service manual. The pictures illustrated in this article are basically how most magnetic cone speakers are made. In the case of the Music Cone, the cone is inverted, that is, the center protrudes toward the listener.

Make sure when you replace the cone that it is properly seated and not applying torque or twist on drive rod (Fig. 1. Also, make sure there are no foreign materials interfacing with armature action. I use an air compressor to remove dirt, etc. You can substitute for the tools shown in Figure 3 by using standard speaker shims. They work equally as well.

GENERAL INSTRUCTIONS FOR ADJUSTING ARMATURE STRIKING POLE PIECES:

(Procedure may vary a little in different kinds of speakers)

Distortion and rattle may be caused by the armature striking either or both of the pole pieces of the permanent magnet.

This is generally determined by inspection, though in some cases the contact may be so slight that it may be necessary to adjust the armature to check on this condition. In any case an adjustment of the armature is necessary.

To adust he armature, a set of spacer tools is necessary.

Figure 3 illustrates the general appearance and correct dimensions of the spacer tools. The stock, obtainable on the open market, should be a phosphorous bronze strip .010" thick and .25" wide. It is bent as illustrated and soldered to hold the opening fairly rigid. The two ends are tapered as illustrated to a .15" width at their extremities.

Two of these tools are necessary when adjusting the armature. Place one tool in the space between the armature and pole piece of the motor mechanism at the end next to the filter unit (Fig 2).

The other tool is placed at the other end of the armature a little to one side in order to clear the drive pin located at this end of the armature. By loosening screw A and B (Fig. 2) any tension in either direction which may have been on the armature is released and the spacer tools will provide the correct clearance or spacing. While the spacer tools are in place a hot soldering iron is applied to the drive pin thrust lever, connection point C (Fig. 1), and the solder heated sufficiently to allow the drive pin to find its normal position with regard to the thrust lever. The iron is now removed. Screws A and B (Fig. 2) are tightened and the spacer tools removed. The armature is now correctly aligned and balanced so that no abnormal strain is being imposed upon it in any direction.

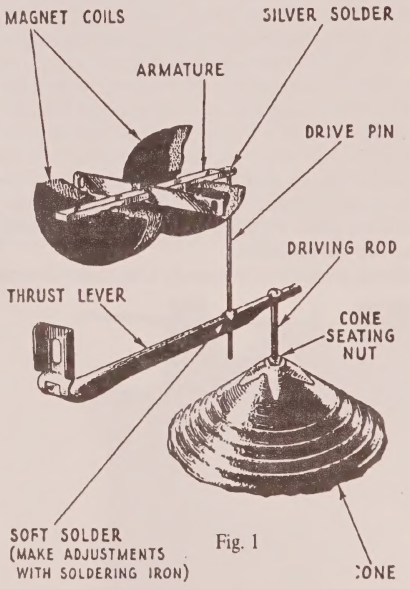


Fig. 1

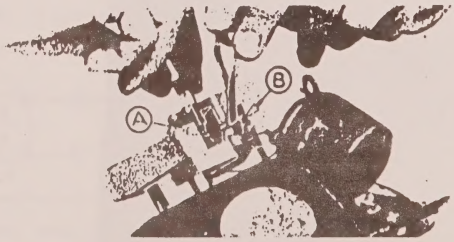


Fig. 2

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SMALL GRID BIAS CELLS

Allan Bryant

Many receivers of the 1930's employed Duo-diode triodes with high mu factors, such as the 75 and 2A6. These were used as a combination second detector, AVC and first audio. The triode requires a low negative bias and has a low plate current. Furthermore the contact potential at the grid is unusually high for a new tube (about +.9V), gradually decreasing with age. Contact potential is defined as that point where positive grid current starts to flow (fig. 1). Contact potential is caused by the initial velocity of emission of electrons from the cathode and an electro-thermal effect due to the differences in temperature and in material composition of the grid and the cathode.

Fig. 1

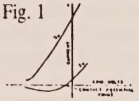
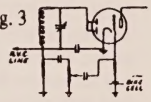


Fig. 2

Fig. 3



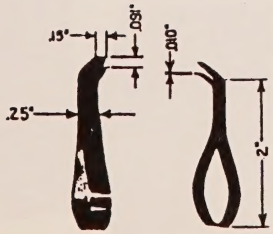
This introduces two difficulties. First, these tubes should operate at -2 volts C bias. If the bias is originally set at -3 volts to overcome the contact potential of +.9 volts, eventually the tube will be over-biased. If the bias is produced automatically by a cathode resistance, the latter would have unusually high resistance for an audio tube. Unless extremely high capacity shunt condenser, which are expensive, are used, considerable RF degeneration (loss of signal strength) will occur. Much of this difficulty is eliminated by the Mallory grid bias cell, shown in fig. 2, This cell is acorn shaped, about 5/8" in diameter and 11/32" deep. It is an electrolytic cell which originally has a no-current potential of 1 volt, and if charged by a current will have a potential not exceeding 2 volts. It holds its charged potential for about 48 hours, gradually dropping to normal.

A typical circuit to overcome the effects of degeneration and varying contact potential is shown in fig. 3. For a new tube, the cell which is in the grid circuit with a grid resistor, cancels all the + contact potential, leaving a net C bias of about -.1 volt. On a strong signal, grid current flows momentarily, charges the cell to -2 volts, and the net bias is -2+ (+.9) = -1.1 volts. As long as the signal does not exceed this value, normal action takes place. Momentary excessive grid signal only recharges the cell.As the tube ages, its contact potential drops and more of the cell voltages are usable. Thus with aging of the tube, it will handle stronger signals. Inasmuch as the cathode C bias resistor is no longer used, degeneration is obviously eliminated as a problem.

These cells were said to have an unlimited life, and the cost of the cell more than balanced the need of cathode bias by-pass condensers. You will find these cells employed in many Stromberg Carlson and later model Spartan receivers.

The problem we collectors encounter today, is what to do with the old cells. If your set has the cell intact, measure its potential with a voltmeter. Most likely it will be dead. Jim Cirner and I have had good luck in rejuvenating dead cells, by letting them soak in rubbing alcohol for a few minutes. This procedure will rejuvenate most cells to approximately 1.2 volts. If this method doesn't work, or if you're missing the cell, try replacing it with an AA cell (1.5 volts). Be sure to observe proper polarity when wiring it into the set.

Fig. 3



RESTORING THE MAJESTIC "B" ELIMINATOR

By Allen BrYant

In this article I will discuss the restoration of the Majestic "B" eliminator, Specifically the Standard and Super models. These eliminators employ a fullwave, gastype, cold cathode rectifier—a BH tube. Three voltage taps and a ground are provided at the output of the supply. In addition, the primary of the power transformer is tapped, providing two voltage ranges which are selected by the "Hi-Low" switch on the front panel. The voltage outputs are controlled by the setting of two carbon compression type pots.

To begin the project, lift off the top of the case and remove the BH tube. Pull the tube straight up and out of its socket. Test the tube. The BH tube is normally good for about 4000 hours service. After that the voltage output will drop off. Flip the unit over and remove the four screws holding the front panel. The front panel and the case join to for a "track." The case should now slide upwards rising on that "track." A screwdriver is usually necessary to get things moving. Note that the bottom edge of the case has a lip on it that tends to catch the internal wires as the case is lifted off. Another way to remove the case, is to press in at the joint of the front panel and the case at the right hand side so as to disengage the track. Then bend the right side out enough to clear the wires and ride the case upon the left hand track.

With the case off, make a continuity check of the chokes, transformer, and pots. The detector resistor is a high failure item, it should measure 7,000 ohms. Its failure symptom is high detector voltage.

Now we come down to the most common failure—shorted capacitors. As most collectors know, you just cannot trust these old capacitors. Even if the unit is presently running, it should be recapped. The capacitor values, shown on the condenser bank diagram are original. You can save space and money by converting to the values shown on the schematic. However, there is a lot of space available in the can, so you might just want to use what you have on hand. The values of the filter capacitors are not critical, but to remain within the desired voltage range, do not exceed 5 MFD. Voltage values are 450 volts, except for the two capacitors across the transformer secondary. These are used to prevent oscillation across the rectifier tube and should be rated at 600 V.

All the capacitors are contained in one tin box. To avoid confusion, I suggest making the terminal numbers shown on the schematic, directly into one unit. A grease pen works well for this purpose. Remove and label all wires soldered to the capacitor box. Then remove the two screws that are holding the front panel in place, and move it as far out of the way as the wires will permit. The capacitor box and all other boxes in this unit, are held between two metal plates which are riveted to the base of the unit. Several long bolts pass through these plates and hold the boxes in place. Remove all these bolts, then clip off the ground wire on the rear of the capacitor box. Next slip the tube socket and its mounting plate forward and free of the unit. The capacitor box can now be slid forward between the rails and removed.

We now can replace the capacitors. Begin by bending the lop on the box outward, so that the cardboard panel can be removed. Pry the panel out of the box and cut all the internal wires leading to it. Take the panel and clean it up, then attach the new capacitors to it being sure to observe polarities and avoid shorts. Next, we have to get the old capacitors out of the can so we can re-use it. The safest way to do this is with a heat gun. I have found that a gun with a 300 degree output works well. To set it up, stand the capacitor box on end and direct the gun at it. In a short time the capacitor pack will slip out.

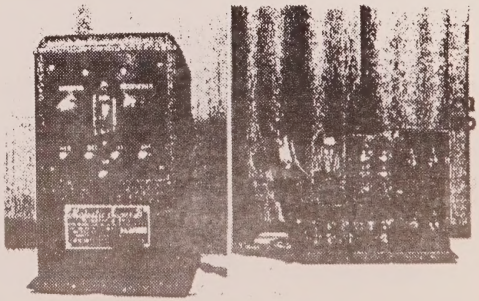
When the above is finished, you are ready to reinsert the capacitors. First put some foam rubber in the bottom of the can to help support the capacitors. Next slip the cardboard panel back into place and bend the metal down to secure it. Put the box back in its position between the rails then reposition the bolts that hold the metal plates together.

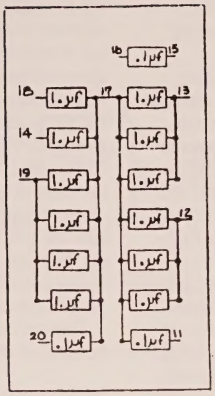
Now is a good time to inspect the condition of the wires in the unit. Replace any that are bare, or have cracked insulation. Resolder the wires leading to the capacitor box. You may also want to install a fuse in the primary circuit at this time. Remember to make it accessible from the top cover. The front panel base can now be reassembled. Reverse the process you used to take them off. Be careful not to snag any wires when putting the case on, or mash any wires under the edge when tightening it down. Place the BH tube in its socket.

Turn on the unit and measure the output voltage in the low range without a load. You should see these approximate voltages (adjust pots for maximum reading) Det = 70v max. Int = 180v max, Amp = 250v max. Note that the amplifier voltage varies inversely with the detector value. If you have no output and your unit used circular shaped pots (vs. oval), look for a short between the pot case and the front panel. If you find one, a little electrical tape will clear it up.

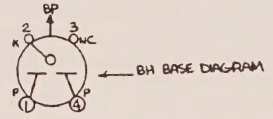
When using this and other eliminators, remember to always turn on the filaments before applying B+, and always turn off the B+ before powering down the filaments.

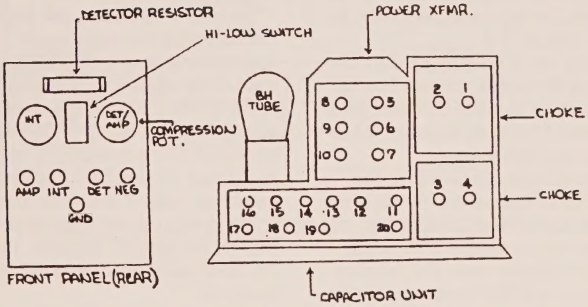
Good Luck.



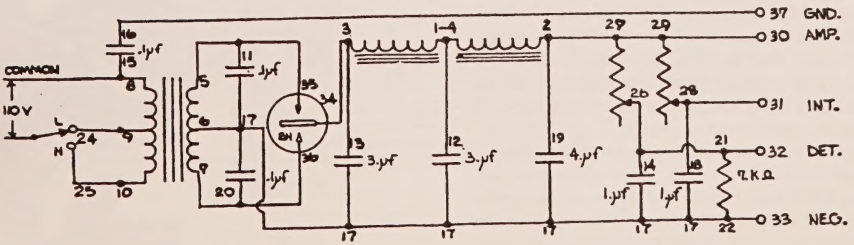


CONDENSER BANK
(INTERNAL)





ELIMINATOR COMPONENT LAYOUT



MAJESTIC STANDARD, SUPER "B" ELIMINATOR

RESTORING THE A-K 40

By Jim Cimer

The following advice should have you well on the way to restoring your Atwater Kent Model 40 A.C. radio to working condition.

Remove power supply and tuner section from metal case, make a continuity check of power transformer, chokes, resistors, interstage transformers, volume control and RF transformers, etc. The detector resistor in the bottom of the bakelite panel of power supply is a high failure item. It should measure 250 thousand ohms. Assuming all steps above have been taken and necessary corrections have been made, we will start with the capacitor problems. As most experienced collectors know, old paper-type capacitors in this case close to fifty years old, cannot be trusted. They all should be replaced with new capacitors. It is very risky to run a set without recapping entirely. I made this mistake with a Radiola 17. I replaced a bad resistor and the set took off and sounded great. I left my shop with the set playing and went into the house. Fifteen minutes later I smelled smoke, The shop was full of heavy black smoke and flames were corning out of the set. The B+ paper capacitor shorted, burning up the 80 rectifier and power transformer. What a mess! The fun part of the job is removing the tar out of the power can to replace the capacitors. Of course, the speaker choke ia potted in the tar right above the power transformer capacitors. There are many ways of removing tar. Set power transformer in an oven or on a hotplate, etc. The trouble with these methods is that you melt all the tar from around the power transformer and choke which is not necessary and you increase the chances of accidental damage to the components. For this reason, many collectors hate to tackle potted power supplies.

Now we will so through my way of doing the job and maintaining control over removing the necessary tar, only from the capacitor area. Remove the first set of nuts to disconnect power cable from power supply panel. Remove the second set of nuts from the panel assembly on top of power supply.

This will allow you to move the panel but not lift it. The capacitor bank and speaker choke are located on the end of the power supply container that does not have the tube socket mounted on it. Refer to power supply diagram in this article, disconnect speaker choke, and capacitor leads. This will allow you to lift power supply panel out of the way so capacitors can be melted out. Let power supply metal cabinet up as shown in the picture, I use aluminum foil to direct melting tar into a disposable metal container such as a coffee can. We have one positive thing going for us at this point. The metal cabinet has a metal divider between the chokes and transformer section and the capacitor bank. There are three filter capacitors and two by-pass capacitors and a speaker choke in the model 40 in this section. Direct shrink tubing heat gun that has a temperature of 550 degrees F. at the capacitor section about 1"-2" away from the tar. After about 15 minutes of melting tar the speaker choke will be free, Carefully fish out tho choke with long nose pliers and set it to one side of metal cabinet. At this point all that is left in this section is the five paper capacitors. Continue applying heat to capacitors section. It will require around 15 to 20 minutes to get most of the tar out of this section. The edge of the capacitors will be visible long before they will be ready to come out. It is necessary to apply heat to the capacitors long enough until you can move them with a large screwdriver. Take a small screwdriver and bend the last 1/4" of the shank to a 90 degree angle. With this tool you can pierce the side of one of the capacitors and pull it out. Once you get one out the rest come easily. Now the hard part is done. Set the power supply cabinet straight and take your heat gun and melt the rest of the tar so the area where the capacitors were is clean and even. Give the power supply a couple of hours to cool to room temperature. Replace the capacitors using values shown in the schematic diagram of this article. To be safe, use 450 VDC rated capacitors for the filters. The two by-pass capacitors can be 200 VDC. This should complete power supply restoration.

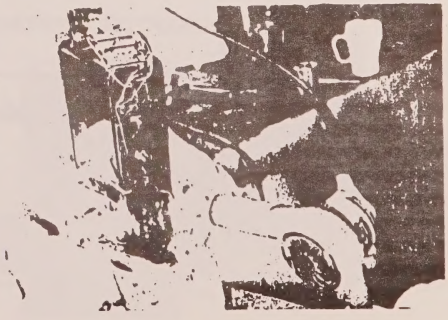
I suggest that you install a fuse block in primary of power transformer. One amp. QB should do it.

Tuner Section

I will make the same assumptions as I did with the power supply section. You have made an ohm meter check of components and made necessary corrections. The RF filter and plate capacitor are mounted in a metal container under the RF chassis. You have two choices, remove metal capacitors container and with your heat gun melt old capacitors and slip new ones in the old container. The second method is throw container away and mount capacitors independently.

The value of the plato by-pass capacitor is .2 MFD 200 VDC, The filament by-pass capacitors are .2 MFD 25 VDC. The speaker filter condenser mounted on front side of the RF chassis is in a sealed container. If you wish to save the container, unsolder the lid with a 200 watt iron to remove old capacitor. The value is .5 MFD at 400 VDC. The heat gun works very well for melting old RF transformer out of its container. I don't bother to rewind them. I replace the old transformer with a modern 4-1 transformer, hiding it in the original container.

This should complete repairs of the model 40, there is very little you can do for RF alignment. There are no trimmer capacitors on the tuning capacitors of this model. Good luck with your model 40!



Melting out the tar with a heat gun

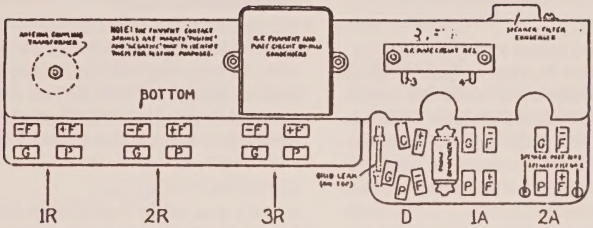


FIG. 70. TEST CHART FOR MODELS 40, 42, 52

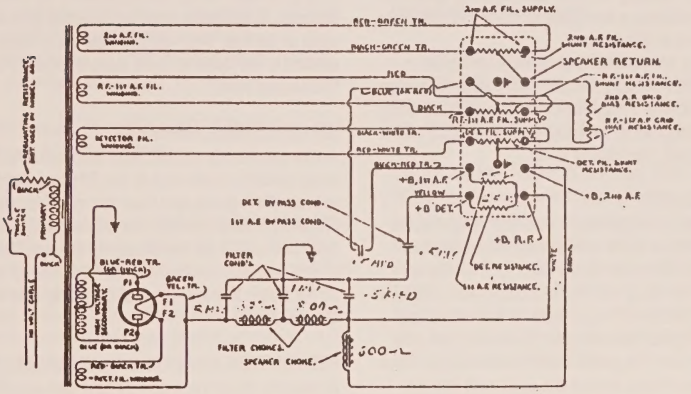


FIG. 63-A. SCHEMATIC DIAGRAM OF POWER UNIT IN MODELS 40, 42, 44, AND 52. SEE PAGE 69 FOR DESCRIPTION OF THIS UNIT. SOME EARLY UNITS OF THIS TYPE HAVE COLOR SCHEME SHOWN AS TO UNIT IN MODEL 38 SET. NOTE THAT COLORS AS NOW STANDARDIZED CORRESPOND WITH THE COLORS OF SET-CABLE LEADS.

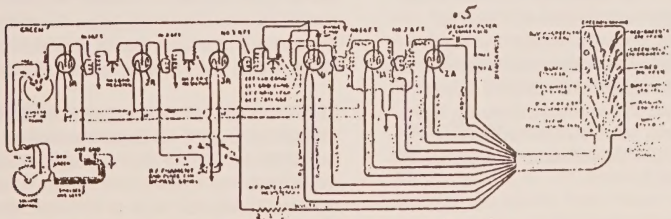


FIG. 71. WIRING DIAGRAM OF MODELS 40, 42 AND 52

Model 52 does not have the shielded antenna lead, but is provided with two twenty-foot leads which are connected to the volume control, black antenna and black green tracer for ground.

REPAIR/RESTORATION HINTS

The Antique Wireless Association shares these old HINTS and KINKS with CHRS in honor of its 20th birthday, courtesy of Lud Sibley:

FROM *THE C-D CAPACITOR*, 1940-42

ELIMINATING "CUT-OUTS"
Receivers which "cut-out" often present service jobs requiring the expenditure of time and labor for which adequate compensation cannot be secured. Condensers are, of course, first suspected, then resistors, tubes, connections, and windings. Yet we can quite often eliminate each of these potential sources of the trouble — and the receiver still intermit. Frequently, the particularly difficult intermittents can be speedily cured by proper attention to trimmer and padding condensers. Sometimes it is only necessary to remove the adjusting screw and clean and free the mica separator and plates of dust and filings. Most often, however, these capacitors cause "cutting out" through a leaking mica separator and, in such instances, a new piece of mica will terminate the erratic performance of the receiver.

A signal tracer may be required to accurately locate the offending trimmer instrumentally. Occasionally, the receiver can be made to "cut-out' at will by turning the adjusting screw or by squeezing the plates together by pressing on the top plate with a screwdriver or other tool. (September 1940)

SHORT CIRCUIT LEADS
In many models of sets manufactured a year or two ago rubber covered power transformer leads were employed which often caused short circuits as the result of the older type of rubber insulation melting or breaking off after hardening. Sets will thus be found inoperative, the power transformer will overheat and smoke, or filament of tubes will not light. To service such jobs, first inspect the leads from the power transformer to tubes. Then separate them, or if necessary, replace the leads with heavier insulated wire. (September 1940)

LEAKY CAPACITOR BLOCKS
If abnormal voltages appear on cathodes of audio tubes, or hum prevails even though individual sections of a capacitor block check OK., test for leakage between sections of the unit. Leakage between sections in many of the capacitor blocks used in the lower priced sets seems to be a common fault. Neon leakage test between capacitor sections will reveal the definite source of trouble encountered. The remedy, obviously, is to replace faulty sections with individual units such as C-D "Beavers' or multiple section units of the same values and voltage ratings. (October 1940)

LOCATING DEFECTIVE CAPACITORS
In the intermittent jobs which are usually so puzzling to servicemen, the writer has employed a very simple method to locate defective capacitors quite satisfactorily. Remove all tubes from the set and apply a DC voltage to the plate and screen grid circuits. A voltage from 300 to 400 volts will be ample. A capacitor in the circuit which is causing the intermittent will readily be located be sizzling, and finally breaking down. Thus the stage causing the trouble can be located, and the defective capacitor replaced with a new unit. (October 1940)

ZENITH MODEL 8S359
Hum in this set as well as other of this type is often caused by a defective 6U5/6G5 tuning eye tube. Before removing the chassis of any set employing this type of tuning eye tube, the writer has made it a practice to remove the tube in order to determine if the trouble is caused from this source. If the hum stops, obviously, replace this tube with a new one. (November 1940)

REPAIRING VOICE COILS
Here is a good way to repair speakers which often have been found to cause distortion. In many cases the first few turns of the voice coil work loose and cause the trouble. In speakers where the cone can be raised carefully far enough to apply a thin coat of aeroplane dope or collodion glue to the first few turns of the coil. This will alleviate the trouble which quite frequently is the result of loose turns of wire on the voice coil. (November 1940)

AN IMPROVISED BALLAST
A 150-watt Mazda electric light bulb makes a dandy ballast for many models of sets such as the Silver model 30. The writer uses an old 4-prong tube base and removes two of the prongs diagonally. Short flexible wire connections are then soldered from the bulb to the two prongs of the tube base. The bulb base is then carefully inserted into he tube base so that connections do not short, and held in place by filling with hot sealing wax. (March 1941)

PREVENTION AGAINST SHORT CIRCUITS
A majority of AC-DC receivers have one side of the power line tied directly to the chassis through the on-off switch. On such receivers, particularly those encased in thin plastic cabinets, the chassis holding bolts protrude sufficiently so as to prevent these sets from short circuit hazard, since many people place these sets on top of unprotected radiators. Whenever tests of this type come in for repairs the writer places two or three strips of adhesive tape over each screw head of the chassis bolts so as to completely overlap both screw and washer. (September 1941)

REJUVENATING OLD VOLUME CONTROLS
This method to renew old carbon type volume controls has proven satisfactory with most all designs of controls, claims the writer. Remove the carbon element of the control and apply a thin coat of aeroplane 'dope' on the contact surface. Before the dope has become dry, dust the surface with powdered carbon such as used for auto door locks, etc. Blow off surplus carbon powder and apply a thin coat of clear lacquer thinner with a camel's hair brush. Allow the thinner to dry thoroughly, then check the resistance of the unit with an ohmmeter If resistance is too low apply the thinner again and rub off some of the car-

bon with a clean, soft cloth and recheck the resistance until the proper value has been obtained. A little care and patience will pay for the time taken to renew many of the old unused controls lying around service shops. (April 1942)

METAL-CLAD RESISTOR REPAIR
Poor contact at a tap on a flat type metal clad wire-wound resistor can often be corrected by means of a simple operation with a screwdriver. Since these resistors are usually mounted flat against the chassis with the metal casing riveted to the chassis at both ends, place a screwdriver between the chassis and the resistor at the faulty tap and bend it up. The bent metal resistor casing forces the tap into tight contact with the resistance winding without affecting the rest of the unit in any way. (April 1942)

SEPARATE LOOP FOR ALIGNING WORK
Many of the newer sets using built-in antennas require the use of a loop to line up the set instead of using direct connection to the oscillator. We have installed a loop of a few turns of wire which is fastened under the work bench. The leads of this loop are brought out to binding posts so that the oscillator can be connected to it. When lining up a set the set is placed into the field of this coil and adjustments made. (June 1942)

"SERVICE TIPS" (and a few "SELLING TIPS") from *RCA Radio Service News*, 1935-39 and 1947.

LOUDSPEAKER FIELDS
The next time that you get a call and find an open speaker field, don't be in too much of a hurry to replace the field. Take the field out and remove the paper coating. Ten-to-one you will find the field open where the fine wire is joined to the heavy wire that is brought out from the field. All that is necessary is to remake the connection and the field is as good as new. (Feb. 1935)

NEUTRALIZING
In neutralizing some of the old sets, a good tube from which one filament pin has been cut off is often used. However, due to the fact that tubes vary in their internal capacity, this does not always work. A better way is to use the tube that is to be used in the stage under test by slipping s short length of drinking straw over the filament pin. This never fails to work and permits a more accurate neutralization job that avoids possible oscillation. (December 1935)

MIDGET SPEAKERS
When you have a midget speaker on the bench that is hard to center, just hook the field coil and the output transformer in series and connect to the 110-volt AC line. Proper centering is indicated when you hear nothing at two feet. however, if the cone is rubbing, the sound will be very bad. (December 1935)

EMERGENCY RECEPTION
On some superheterodynes, emergency reception may be provided by connecting the grids of the first and second detectors together, thereby eliminating a defective oscillator or IF amplifier, and making the receiver work as a TRF job. (Dec. 1935)

MAGIC-EYE TUBES
If the 6E5 tube is operating but the screen is a very pale shade of green, check the 1-megohm resistor before condemning the tube. Very often this resistor will be found to have changed its value. (March 1936)

COLOR CODE
Radio servicemen are often unable to determine the value of a coded resistor because they do not know the color code and have lost or misplaced their trick color code cards. All of them, can tell how many days are in each month by the old ditty, "Thirty days hath...etc." The following catch phrase is almost as simple. It is necessary only to remember the code begins with black ("0") and ends with white ("9"), and that "Mr. BROYG wears BVGs." The letters BROYGBVG can then be counted on the fingers of one hand, and — presto! — there is the value of the unknown. (March 1936)

CLEANING CABINET
For eradicating acid [*sic, but it's still caustic!*] on chassis caused by capacitors exploding, use a good mechanic's soap on a dry rag. It works wonders. (July 1936)

INCREASING SELECTIVITY OF TRF SETS
When an old set becomes less selective, especially an old TRF set, the best solution is of course to sell a new radio, but when that cannot be done and the customer wants to get certain stations, add a little feedback to the second RF stage by twisting a turn of insulated wire between the second- and third-stage grids and adjust for best results. A small trimmer condenser on the first stage and attached to the panel can be used to best advantage in this case. (July 1937)

REPAIRING SHIELD
I had a set in which the grid lead coming out of the IF shield had been pulled so hard that it had ripped the shield about an inch and a half. The lead was replaced and the set was otherwise OK after realignment, but that shield with the cut down the side looked terrible. Tin foil was much too bright. However, I found a deluxe wrapping paper in a so-called gold and silver finish. The latter is actually a dull aluminum and matched perfectly when affixed with waterproof cement. (July 1937)

MAJESTIC 90 and 90B
When you have to replace the line-ballast resistor in an old Majestic 90, 90B, etc., try rewinding the old form with wire from an old 20-ohm rheostat from a battery set. The wire is just the right size and length. It is also heavier wire than the original and will stand up better. (July 1937)

SAFETY-FIRST TONGS
While servicing a set "hot" I have found a pair of photo print

tongs, made of bamboo and available in any photo-supply store, of value since loose connections can be spotted by taking hold of individual wires with the tongs and shaking them. As the tongs are non-metallic, danger of shorts or a bad shock are eliminated. Also, parts may be held in place for soldering without danger of burned fingers. (November 1937)

DRIFTING ON HIGH FREQUENCIES

With an Atwater Kent 318, I experienced some trouble with drifting on the high-frequency end of the scale. I found that I could eliminate this trouble by cleaning the oscillator trimmers. (*This tip applies to all receivers — RCA ed.*) (November 1937)

QUICK TEST FOR AC-DC RADIOS

A short cut in locating open filament circuits in AC-DC sets quickly (and who doesn't need short cuts on AC-DC sets?) is to use a 15-watt 110-volt lamp bulb on a length of lamp cord, with prods on the free ends. Plug the dead set into an outlet, turn on the switch, and test the wiring beginning with the AC line cord entering the set. If there is voltage there, the lamp will light. If not, carefully examine the line cord for breaks, and repair if found. If the line cord has a resistance in it, check the resistance lead at the plug. I have found many a broken lead here due to amateur repairmen putting on a new plug. (They don't see the small resistance wire, so don't connect it up.) If you have voltage at the set, test each tube filament with the prods, and the one causing the test lamp to light is your bad tube. A simple and QUICK way to locate open filament wiring, and it really does save time over testing each tube separately in the checker, and does not burn out the rest of the tubes like you do sometimes if you try shorting filaments to accomplish the above results. (November 1937)

LINE CONDENSER

I have made it a point to check the line condenser for "shorts" or "leaks." A bad condenser will result in a burned-out antenna coil if a radiator or water pipe is used as an aerial. And plenty of radiators are used as aerials! (June 1938)

NEW SET SALES

I have made many radio sales by close observation of the prospect and his family. For example, if there are children around ten or eleven years of age in the family, I tune in on police calls or aviation and amateur calls. This fascinates them, and they use their influence toward keeping the receiver. If the parents are of foreign extraction, I tune in one of the shortwave stations from their country, which is extremely effective in closing sales. This is a very simple idea, but it certainly produces results. (June 1938)

INSECT TROUBLE

Recently I had a midget receiver (Sparton) completely infested with cockroaches that were causing the trouble. To remedy this epidemic I used "Eng Lighter Fluid" to rid coils and then blew out and powdered "20 Mule Team Borax" in the cabinet of the set. Was there recently to see how it was working, and, believe me, no insects of any kind were around that set! (October 1938)

POWER TRANSFORMER PROTECTOR

On sets having power-transformer failures, I always install a miniature socket with a 6.3-volt dial light of either the 0.15- or 0.25-ampere rating (depending on the total current drain from the rectifier) in series with the center-tap lead from the high voltage winding, so as to burn out when a condenser breaks down. This stunt has never failed yet on numerous sets and is a sure guard against transformer burn-out. (October 1938)

METAL PARTICLES IN SPEAKER FIELDS

This is generally one of the most exasperating problems, due to the fact that the particles are almost always magnetic (iron or steel) and will cling to the field poles. These particles get in various ways and are too often due to the serviceman himself, for example, when the output transformer is being replaced and the rivets are drilled out. The result of these chips or filings is noise and terrible distortion. They must be removed. The easiest way is to apply AC direct to the field, which destroys the residual magnetism and allows the metal particles to be blown out or wiped out with a magnetized steel shim. Use 110 volts AC for the regular household set speaker and 10 or 20 volts for automobile receivers. December 1938)

TUNING CONDENSERS

In radios using dial belts or cable for drive, make sure the variable condenser is free to move before replacing the belt. Most condensers have a tension-adjusting screw in the rear. Loosen the lock nut and let the screw out just enough to free the condenser. Put in a drop of Nujol between the condenser shaft and bearing, then adjust set screw and tighten lock nut, making sure the plates of condensers are equally spaced. Then, as a finale, check the padders for peak. On some dial belts, by simply turning the belt over so the outside of the belt is on the inside, slipping will be cured. (December 1938)

SOLDERING IRON HOLDER

Secure one of the old-style 524s, the one with the ventilated cage surrounding the elements. Simply remove the octal base and rectifier elements. Line the inside with asbestos and that's all there is. December 1938)

ANCIENT VINTAGE CROSLEYS

A great many Crosley (metal-box) receivers of ancient vintage show up when the independent serviceman does a little trading. It is difficult to dispose of these sets now. It will be found profitable to dismantle them and salvage the screws, nuts and other standard parts. In dismantling the set, do not overlook the two insulators extending through the variable or gang capacitors (stationary portion). These insulators make excellent non-metallic screwdrivers for alignment work. Tools of this sort are usually quite expensive, although very necessary. By dismantling old sets many items such as this may be discovered. (June 1939)

USE FOR OLD TUBES

We have solved one of the most serious problems of our business. To dispose of our old tubes we place them in a box and save them for target practice. They make a fine 'pop" when hit. We're now going to see what can be done about old razor blades. (June 1939) [*The really old low vacuum in the Audions no doubt made a particularly satisfying report! CHRS ed.*]

HANDY TOOL

The handiest tool in my radio kit is a piece of spring steel ten inches long, 1/16 of an inch wide, and five thousandths (0.005') thick. One end is tapered to a razor edge and is used in cleaning the plates of tuning condensers. Another use of this tool is cleaning voice coil channels. This is done by holding it against the magnet of an old RCA magnetic speaker, thereby collecting all metal shavings from a dead speaker. (June 1939)

TUBE TESTER SELLS TUBES

We have printed in large letters on the outside of our tube tester case "WEAK TUBES MAY CAUSE DAMAGE TO YOUR RADIO." Upon entering a customer's home, we try to set the tester where it is sure to attract attention. The customer usually asks for an explanation and we really give one. We mention the danger of a tube shorting and burning out a power transformer. A comparison of the replacement costs of a set of tubes versus a power transformer is a very effective selling point. This, plus the normal tone and performance improvements to be experienced with new tubes, will nine times out of ten create a sale. (June 1939)

BEN GIVES IT

When I finish a job, I give the customer's radio a polishing. Then I present the owner with a small sample bottle of RCA Furniture Polish. The bottle has a small label on which my name, address, and other information serve as a reminder of my business to the customer. A small polishing cloth with the same message on it is also a good souvenir of my call. A repeat job is usually the result. (June 1939)

HYPODERMIC NEEDLE FOR NOISY CONTROLS

The next time you get a noise volume control, try this easy remedy. Mix carbon tetrachloride [*today trichloroethylene!— and don't breathe it!*] and Lubriplate in equal parts. Place the mixture in an ordinary hypodermic needle, and inject into any available aperture on the control. The small space where the shaft enters the control is sufficient to permit entrance of the needle. You can use the same method for push-button controls, band switches, and similar parts that are tucked away in inaccessible places. (March-April 1947)

SIMPLE METHOD TO PREVENT THE BLOWING OF TUBES

When a portable receiver is serviced, make certain after disconnecting the line cord that several seconds are allowed to elapse before it is plugged back into the line. The delay is important because unless the condensers are fully discharged, there is a possibility that the tubes in the receiver may be damaged. {March-April 1947) [*Something may have gotten garbled in the original 'tip': the most important reason for letting the capacitors discharge is to protect tubes when one is being plugged into the set - otherwise the whole string of fragile 1T4s, 1S5s, etc. may be hit with a big overvoltage from a capacitor that has charged to an unusually high voltage. LAS, AWA ed.*]

SMALL SPINTITE WRENCHES MADE FROM ALLEN SCREWS

The standard sets of Spintite wrenches do not include units to fit very small nuts. Here is a simple way of rounding out your Spintite kit. Purchase a complete set of Allen set screws. These should be as long as possible. Grind down the threads and force-fit the threadless shank into a 7-inch piece of brass or copper tubing. Make certain, when grinding, not to remove too much metal or it may break off below the head during use. The result is a complete set of Spintites to take care of almost any small-size nut. (August-September 1947)

REPAIR/RESTORATION HINTS FROM *SYLVANIA NEWS, PART II.*

Some of these ate included more for "old-time funk" than restoration.

SPEAKER REPAIR

Experience has shown that the most satisfactory solution to the problem of a defective speaker is to replace it. This holds true for the majority of speaker ailments. Many defects can, however, be satisfactorily and permanently repaired. Several cases have been encountered where the wire-braid which links the voice coil winding to the terminal strip, has been broken at the point of entry to the cone. The braid is bent sharply so that it will lie flush with the cone.

Vibration does the rest. The first step in repair is to loosen the voice coil lead from the cone with cement thinner. The remaining tab of wire-braid is next carefully unsoldered from the voice coil lead. The wire-braid leading from the terminal strip should now be inserted so that it extends through the cone about 1/4 inch. (The braid is usually long enough to do this without replacing it.) The voice coil lead is wrapped around the protruding wire-braid next, and then soldered. The voice-coil lead, joint, and braid are secured to the cone with radio cement. A little radio cement applied to the underside of the cone at the point where the braid enters the cone will prevent this problem with the other lead. (November-December 1957)

SCREW ALIGNMENT POINTER

Adjustment of trimmers and controls of TV sets can result in quite a bit of extra work if the trouble is found elsewhere and it is necessary to return the adjustments to their original positions. It is easy to lose track of where they were before, especially in the case of recessed adjustments. To simplify this, I use common bobby pins and solder the open end by wrapping around some fine tinned wire and soldering. This makes a pointer with

good tension that can be slipped on the shaft of an alignment tool and moved up or down the shaft for best position. During trimmer alignment I insert the tuning tool into the adjustment screw and then move the pin down the shaft of the alignment tool close to the chassis, marking the chassis to coincide with the end of the pin as a reference point. By observing the movement of the pointer it is easy to see whether the adjustment is 1/4 turn, etc., and right or left. (March 1956)

COVER SWITCHES ON BATTERY PORTABLES

The switches which open and close the "A" and "B" circuits of personal-type portables are usually operated by opening and closing the cover. Many times the switch is not pushed down far enough to cut off the circuit, thereby running down the battery. I add a bead of solder to the exposed part of the switch on sets which have this trouble. The longer lever will insure that the switch opens every time. (March 1956)

REPAIRING PHONO DRIVE WHEELS

For emergency repairs on working phone drive wheels which do not have any holes or dents in the rubber rim, but are worn sufficiently to slightly change the speed of the turntable, or if worn where insufficient drive pressure is maintained, the following tip may be worthwhile. We have found some of them going strong a year after this "temporary" repair is made. Carefully peel the rubber from the rim of the wheel and cut a narrow piece of white physician's tape just long enough to reach around the periphery in the slot without overlap, and with the sticky side toward the wheel. Then replace the rubber ring in its original position on the wheel, smoothing it down carefully and evenly. This will increase the diameter very slightly and also the pressure against the driven turntable. This stunt can be used in recorders and other units using the same type of drive. (Feb. 1953)

CRACKED PLASTIC CABINETS

Cracks on radio or television receivers may be easily and neatly repaired by following the steps listed. First, apply carbon tetrachloride [*today, trichloroethylene! — ventilated!*] along the crack on the inside of the cabinet, to remove any grease or other substance. Second, apply radio cement the full length of the crack and about $^1/_2$ inch on either side of the crack. Third, place one-inch gauze bandage over the crack, press smoothly and apply a little more cement on top of the bandage. While drying, a weight should be applied to keep the crack closed tightly. This will do a neat, clean and permanent job. (March 1952)

REMOVING STUDS FROM PLASTIC CABINETS

I have found that the studs holding the backs on plastic cabinets (Emersons, for example) get stuck due to standing and cannot be removed easily. These will release quickly if a hot soldering iron is held against them for a few seconds. (October 1951)

AID IN STRINGING DIAL CABLE

Most of the difficulty in stringing dial cable is caused by its slipping off the first pulleys while it is being put on the later ones. This can be prevented by taping it to each pulley with cellophane tape. For those cases where it has to be pulled through in order to locate the pointer, etc., a cardboard strip on top of the cord, held in place with the tape, will allow the cable to slip enough for the required adjustment. (June-July 1951)

CORRECTING WEAK CONVERTER OSCILLATION IN 3-WAY PORTABLES

Before replacing batteries and tubes in these sets, I have found it is a good idea to reduce the screen voltage of the converter tube, ordinarily a 1A7GT. Lowering this voltage has in many cases made it possible to obtain satisfactory reception with the line voltage as low as 80 volts. This is easier on the tubes than raising the filament voltage and will not cause trouble when the line voltage goes above normal. (March 1951)

SUBSTITUTING A PM SPEAKER FOR AN ELECTRO-DYNAMIC

When a customer is anxious to have his set back quickly and you do not have the necessary filter choke to do a good job, you can keep him satisfied by fastening the field coil and pole piece in some out-of-the-way spot as a temporary measure. It may make it more convenient to mount the coil and pole piece if you remove the cone and cone bracket. Most of us have an assortment of PM speakers on hand, so that there should be little delay in making the necessary repairs. (February 1950)

AID IN STRINGING DIAL, CORDS

Here is an idea that I use to great advantage in stringing dial cords. I take a 10-cent plastic crochet hook to reach into close places and handle the cord, tying the knots, etc. The same plastic tool can be used as an alignment screwdriver by dressing down the blunt end with a file. (November 1948)

NOISE AND DISTORTION CAUSED BY TUNING-EYE TUBE

Many servicemen are inclined to pay little attention to tuning-eye tubes when servicing radios, for the reason that they contribute nothing to the operation except as a tuning aid. I have found that they can contribute a lot of hard-to-locate trouble such as noise and distortion. If the elements in the tube are loose it can cause noise, or if the tube is gassy it can cause poor operation of the AVC system with distortion and fading. (November 1948)

AID IN SOLDERING

You will find this to be a big help when soldering to terminals having a large number of wires. Insert the end of a small rat-tail file or a nail into the hole in the lug while heating up the joint, so as to make room for the new lead. The solder should not stick to the nail, or steel with ordinary fluxes. This will overcome the usual trouble of having two leads slip out while you get a new one in. (October 1948)

SPECIAL WRENCH FOR DRIVE-SHAFT SETSCREWS

Some sets, especially Philcos, use a special screw on the dial cord drive wheel for which no wrench is available, and in many cases they are so placed that they cannot be reached by pliers. A special wrench for these can be made by sawing a 1/4" deep slot in the end of a 1/4" steel rod. Use a hacksaw with two blades and widen the resulting slot to about 1/8" to fit the end of the set screw. A hole in the other end for a T-handle or a nut brazed on to fit a socket wrench will complete this useful tool. (June-July 1948)

SEALING ALIGNMENT SCREWS

Many of the "little things" a serviceman does in repairing a radio do not show. For example, few people understand about aligning a set. To them it seems to be another superficial item to increase the serviceman's profit. I have a practice of putting a little fingernail polish on the trimmer screws after they are set. For IF cans and screws below the chassis that are adjusted from the top, I put scotch tape over the holes and put the nail polish around the edge of it. This practice seems to impress customers that I have made a sincere effort to do a thorough job. I also find that people are less likely to tamper with sets fixed this way and the set remains aligned longer and better. (March 1948)

NEW ELECTROLYTIC CONDENSERS MAY PRESENT A SERVICE PROBLEM

We believe servicemen will be interested in the following, as it may affect their servicing of the newer sets as well as in the replacement of older filter condensers by units of more modern design. During the war, advances were made in the manufacture of electrolytic condensers which permit larger capacitance to be obtained in the same-size can. In some cases, this may permit a set manufacturer to use a resistance-capacitance filter or a receiver to have lower hum output than the corresponding pre-war set. There is a possibility of damaging the rectifier tube if too large a condenser is used without compensating changes to prevent overload. The tube, being the part which shows the effect of an overload first, is quite likely to be blamed unjustly in case of failure. Many servicemen keep a few 'weak' rectifiers handy on the bench to use when checking sets suspected of filter trouble, or to reform newly installed filter condensers. This is good practice, particularly with new condensers, because the quality rating of an electrolytic condenser is given in terms of "milliamperes leakage current per microfarad." After standing idle for some time this momentary large leakage, plus the usual high charging current may be higher than the rectifier can supply. The way design engineers overcome this is by the addition of a small series resistance in the lead to the plate, 15 ohms being a probable value. Manufacturing tolerances on condensers are quite wide, so that a 10-mFd unit may even be as high as 24 mfd. Servicemen should observe the following precautions to avoid early rectifier failure.

1. Don't remove or short out a small series resistance in the rectifier late circuit to get a little higher volume.
2. When using a larger-than-original filter condenser, add resistance in series with the plate.
3. Reform replacement condensers or use 'weak' tubes as mentioned above. (May-June 1946)

SHORTS IN IF COILS

When shorted IF coils are indicated in sets using shielded units, set the receiver upright and jar slightly to dislodge any small shakeproof washers and pieces of solder which might have found their way into the shield cans and onto the trimmers, shorting them. If shaking does not remove the trouble, remove the shield can before unsoldering the leads from the coil and examine to see if the trouble is a trimmer short. It is surprising the number of cases of "shorted' IFs which can be cleared up this way. (February 1946)

ALIGNING RECEIVERS WITH BUILT-IN LOOPS

In cases where you have trouble aligning these receivers, particularly at the upper end of the dial, reception may be improved by shorting or connecting a fixed condenser (0.002 or 0.02 mFd) across the antenna and ground terminals provided for use with external antennas. Certain makes of receiver provide for this with a shorting bar. (June 1945)

TO FIND A BREAK IN A MICROPHONE CABLE

A simple way of finding which end of a microphone cable has a break in it is by measuring the capacitance from the shield to the inner wire. The end having the lesser, or "no," capacitance, will be the end where the break is. (June 1945)

TUBE REPAIR

I have found that is it possible to weld the filaments of tubes such as the 12-, 35-, and 50-series by the simple expedient of a Ford spark coil and 6-volt storage battery. While this repair is not sure-fire, due to breaks occurring near the base of the tube where the filament is welded to the wire going to the base pins, it will be effective in half or possibly more cases. I have performed this operation on a quantity of tubes with very good results, and have had very few "kick-backs" and these only on 50L6s. Practically everyone knows how to connect a spark coil up, so there would be no need in going into that. However, after hooking it up, the two top wires on the coil should be connected directly to the filament prongs of the open tube, and the juice then turned on. If arcs are visible in the tube base, or within the tube structure, chances are that tube cannot be repaired due to the breaks being too far apart; however, if there is no arc visible, the possibility is good that the tube has been successfully welded together, which can be checked by a tube tester, ohmmeter, or insertion into the set. If a first attempt at welding a tube filament checks good, and the filament opens up again, it can be put through the process repeatedly until the weld is complete, or arcs appear, in which case the tube is "open' to stay. This is by no means to be considered practical where replacement tubes are available but, the tube situation being what it is, it will sure help to get those dead sets off the shelf. (Nov. 1944)

PHILCO 1942 AUTOMATIC RECORD CHANGER

The selenium cell used in 1941-42 Philco changers can be tested by connecting it directly to a 250-millivolt meter or a 1-milliamp meter, which is more common. Under a strong light or direct rays of the sun, a good cell will go close to full scale on a 250 millivoltmeter. (April 1944)

FIELD COIL BURNOUTS

I spent much time on a Crosley Model 58 trying to increase the volume to normal, but nothing seemed to help much. Finally, another dynamic speaker was plugged in place of the regular speaker, and the volume appeared to increase. Checking the regular speaker, I found that at some time the field coil had apparently burned out, and instead of repairing or replacing it, the connections from the speaker to the plug had been rearranged so that the 45 output tube received its positive voltage through the output transformer primary, but no current flowed through the field coil to energize the speaker. A quick and entirely satisfactory repair was made on the field coil, by checking it with an ohmmeter to discover where the circuit was broken, which in this case was very near the core end of the winding. Then, by scraping the enamel insulation from a few turns of the winding along the outside of the coil near the core, and tapping it, the entire winding from the tap to the outside of the coil was OK, and when the connections were returned to normal, the radio performed normally, with very good volume and tone. The few turns at the inner end of the coil that were bypassed in this way have no effect, and the change in resistance is not noticeable. To check the coil for the break, I connected the ohmmeter to one end of the winding, and, using a sharp prod, scraped through insulation along the side of the winding until a point was reached where the indication changed. Repairs could also be made near the center of the coil, simply by shunting the break along the edge of the coil, after which the coil is retaped. (April 1944)

REPLACING THE BH RECTIFIER TUBE

The BH rectifier tube in some of the old-timer radios can be replaced by changing the socket and using the OZ4 or OZ4G. The voltage and current conditions will nearly always be within the limits of the OZ4; however, these operating conditions should be checked to make sure that there will not be an overload on the tube. The large pins are the plates on the BH and No. 2 is the cathode. (Oct. 1942)

WAR TIME EMERGENCY REPAIR OF ELECTRO-DYNAMIC SPEAKER FIELD COILS

Field coils which are open and for which replacements cannot be secured due to national-defense restrictions, can in most cases be repaired by simply connecting an auto spark coil across the open field coil, leaving it on until the field shorts closed. This sparking burns across the open break inside the coil so the wire closes again. The heat from the spark is so intense it tends to fuse the wire together and forms a fairly permanent war-time repair. This is also effective for the repair of open power transformers and power chokes. (March-April 1942)

SOLDERING LEADS TO CRYSTAL CARTRIDGES

Crystals used in phonograph pickups and recorder heads are permanently damaged if subjected to temperatures above 130°F, even for a very short interval of time. This makes it essential to use extreme care when soldering leads to crystal cartridges, so they are not overheated and ruined. The following precautions must be observed to do a good soldering job.

1. Use a hot iron. If the iron is not hot enough, it will be necessary to hold it against the soldering lug for a relatively long time before the solder will flow. This long contact will permit heat to flow to the crystal, raising its temperature beyond the safe limit.
2. Be sure the connecting wires are thoroughly clean. If the wires are old or dirty, the solder won't take immediately. Continued heating and application of solder may easily ruin the crystal. It is always a good idea to clean and tin the wire first so you will be sure the solder will take properly.
3. Be sure your soldering iron tip is clean. A heavily corroded soldering iron won't melt and flow solder properly.
4. Work quickly. If the iron is hot and clean, and the terminal wire properly tinned, all you need for a good job of soldering is a quick touch of iron and solder to the connection. Take the iron away just as soon as you see the solder flow.
5. Never solder a lead to the case of the crystal cartridge to serve as a ground. This will invariably raise the cartridge temperature above the safe limit. (Nov.-Dec. 1940)

FABRIC DIAL BELTS

Woven-fabric dial belts usually have an idler pulley pressing against them, causing them to stretch. When this happens, the tuning slips. If a new belt is not on hand, a temporary repair may be made by putting a layer of white adhesive tape on each pulley. This gives better traction and takes up the slack. (March-April 1939)

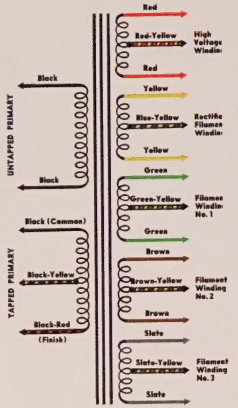
CHECKING GASSY TUBES

When checking tubes on a tube tester that has a gas test, it is advisable to burn each tube about three minutes before the gas test is made. As easy way to do this, if the set is being worked on, is to turn on the set and with all tubes burning take them out one at a time for test. With this method the tubes are warmed up sufficiently for an immediate test. This is vitally important for testing for some abnormal condition such as fading, etc., as a gassy tube, as a general rule, will not show up gassy until it has been warmed up for about three minutes. (July 1937)

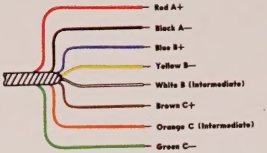
LABEL FOR STOLEN RADIOS

In our location, which is a summer resort, we lost quite a few rental sets until we used stickers on the bottom of the cabinet where only a serviceman could see them. If all servicemen would use this method and co-operate in the return of stolen sets the individual servicemen would suffer much less than in the past. Our stickers read: "Fellow servicemen; this is a rental set stolen from PARK RADIO CENTER, Seaside Park, N. J., Phone 265, please communicate with above." (February 1937)

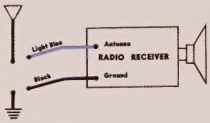
Power Transformer



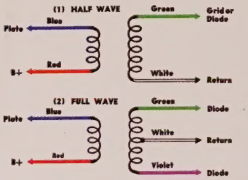
Battery Cable



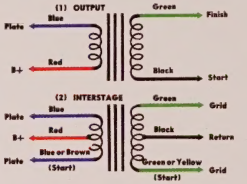
Antenna and Ground Lead



Intermediate Frequency (I.F.)

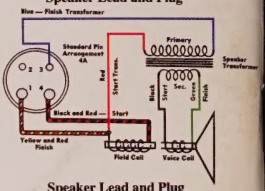


Audio Transformer

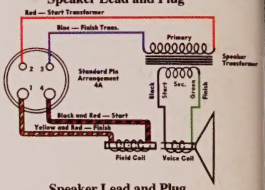


Electrodynamic Speaker Wiring

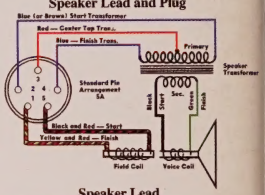
Speaker Lead and Plug



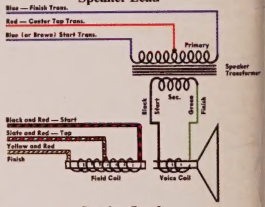
Speaker Lead and Plug



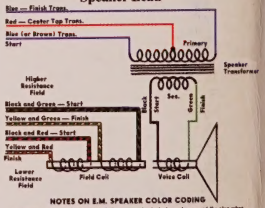
Speaker Lead and Plug



Speaker Lead

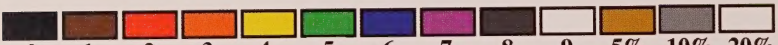


Speaker Lead



NOTES ON E.M. SPEAKER COLOR CODING

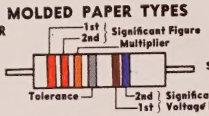
1. The start, tap, and finish of all windings occur in clockwise order around the plug when the plug is viewed from the socket end.
2. All two center leads are to have 50/50 striped designs.
3. When 2 fields are used on a single speaker, the field of lower resistance shall have leads using common red color; the leads of higher resistance field shall have common green color. In case of three fields, field having highest resistance shall have common orange color.



Composite Capacitors

MOLDED PAPER TYPES

TUBULAR

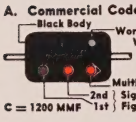


A 2 digit voltage rating indicates more than 900 V. Add 2 zeros to end of 2 digit number.

C = 22000 MMF
T = ± 10%
V = 1600 Volts

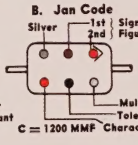
MOLDED FLAT

A. Commercial Code



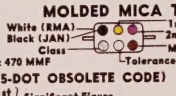
C = 1200 MMF

B. Jan Code



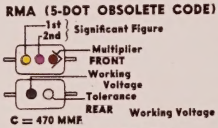
C = 1200 MMF

MOLDED MICA TYPES



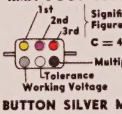
C = 470 MMF

RMA (5-DOT OBSOLETE CODE)



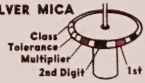
C = 470 MMF

RMA 6-DOT (OBSOLETE)

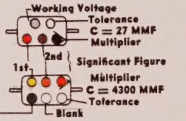


C = 4700 MMF

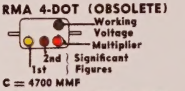
BUTTON SILVER MICA



C = 700 MMF



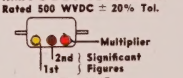
RMA 4-DOT (OBSOLETE)



C = 4700 MMF

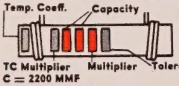
RMA 3-DOT (OBSOLETE)

Rated 500 WVDC ± 20% Tol.



C = 4700 MMF

EXTENDED RANGE TC CERAMIC HICAP

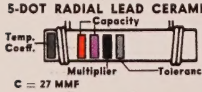


C = 2200 MMF

AXIAL LEAD CERAMIC

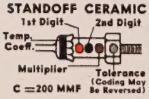
C = 270 MMF

5-DOT RADIAL LEAD CERAMIC



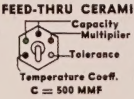
C = 27 MMF

STANDOFF CERAMIC



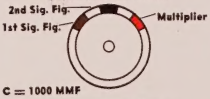
C = 200 MMF

FEED-THRU CERAMIC



C = 500 MMF

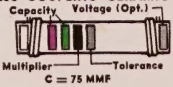
CERAMIC BUTTON



C = 1000 MMF

View from Soldered Surface

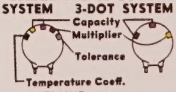
BY-PASS COUPLING CERAMIC



C = 75 MMF

DISC CERAMIC RMA CODE

5-DOT SYSTEM 3-DOT SYSTEM



C = 470 MMF

C = 170000 MMF

Fixed Composition Resistors